HEATING AND VENTILATING

JULY 1929

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STANWOOD SMOKELESS BOILERS

THE STANWOOD CORPORATION
Established 1891 *Cincinnati, Ohio*

Heat—*down* in the "Working Areas"—Instantaneously

[Proved by the Smoke Test at Minneapolis Thresher Company]

Turn on the heat, and the fan, and instantly a flood of warmed air starts to circulate—**down in the working areas where it is needed.** These photographs taken in one of the buildings of the Minneapolis Thresher Co., tell the story of McQuay efficiency better than words.

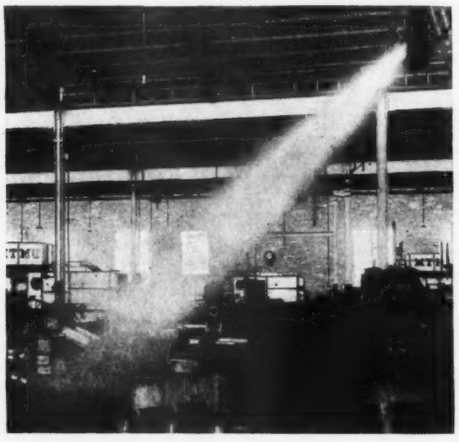
One McQuay Heater (Number 660), weighing less than 150 pounds will heat as much floor space as 4000 pounds of cast iron radiation, comfortably warming 2500 sq. ft. of area, and driving the heat as far as 75 feet.

Taken immediately after turning on the heat and fan this photo shows the flow of heated air starting down.

McQUAY UNIT HEATERS

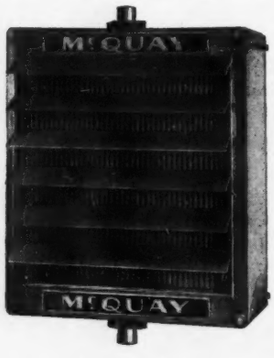
Cut your heating costs in two ways. They get the heat down where it is needed, so they don't use a big share of the heat to warm the unused parts of your factory—up near the roof—as with old-time heating methods.

And they *cost less to install.* Another saving.



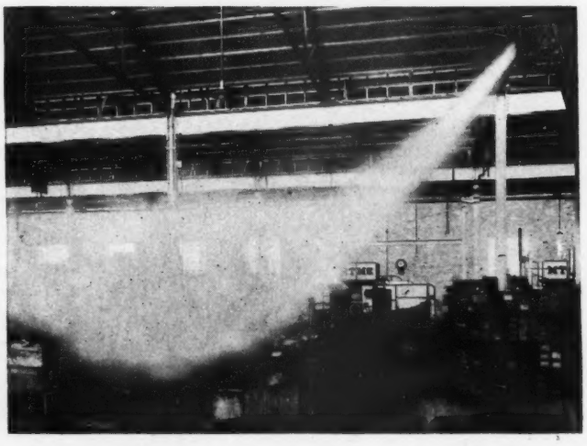
5 Seconds Afterward the heat is down to the floor and starting to spread.

Heating Elements — All Copper — Brazed Eliminating Leaks



Before a Heater leaves our factory it is *triply tested. First* with a steam pressure far greater than will ever be put into it. *Second* to be sure it gives all the heat guaranteed by its rated capacity. *Third* to be sure the fan is noiseless. So you can bank on a McQuay to be *right,* work right, and stay right.

Any Heating Contractor will quote Prices and Specifications.



Another 5 Seconds and the heat has spread—along near the floor as far as 75 feet from the heater. Note that all the heated air is forced down into the working area.

McQUAY RADIATOR CORPORATION

General Sales Office: 35 East Wacker Drive Chicago
Boston: 10 High Street Cleveland: 291 E. 149th Street
New York: 2148 Graybar Building
Newark, N. J.: J. F. McLaughlin Co., 738 Broad Street
Pittsburgh: Bushnell Machinery Co., Century Building

v.26, pt.2

KEWANEE

Water Heating GARBAGE BURNERS

Hot Water is as necessary as Heat

In basement, bathroom, kitchen—all over the house—a plentiful supply of hot water must respond to the turn of the tap. Hot water is as necessary as heat.

And Kewanee provides the means of making both.

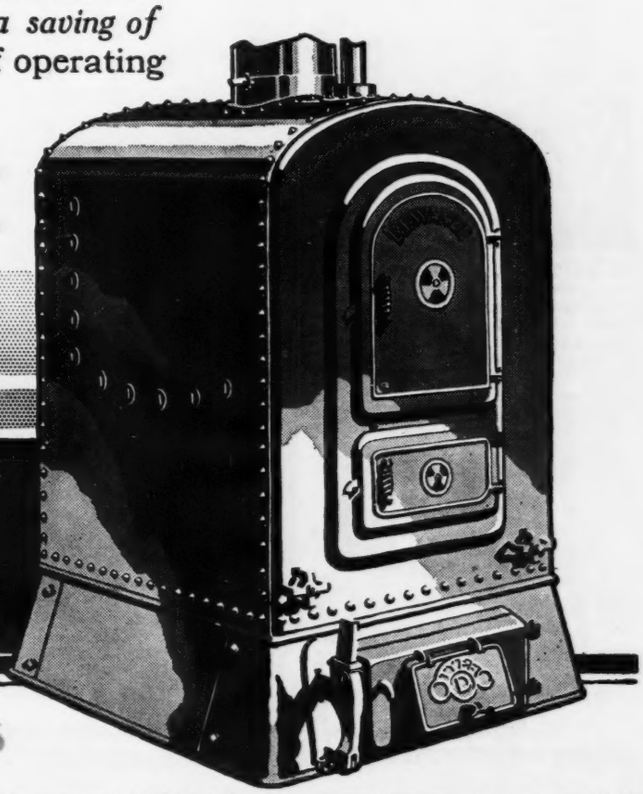
As modern as a Kewanee Boiler, is a Kewanee Water Heating Garbage Burner. Riveted steel to stand the gaff, it gives a lifetime of repair-free service.

And it uses garbage and rubbish as part of the necessary fuel—*a saving of from 20% to 50%* of the cost of operating ordinary tank heaters.

KEWANEE BOILER CORPORATION

Kewanee Illinois

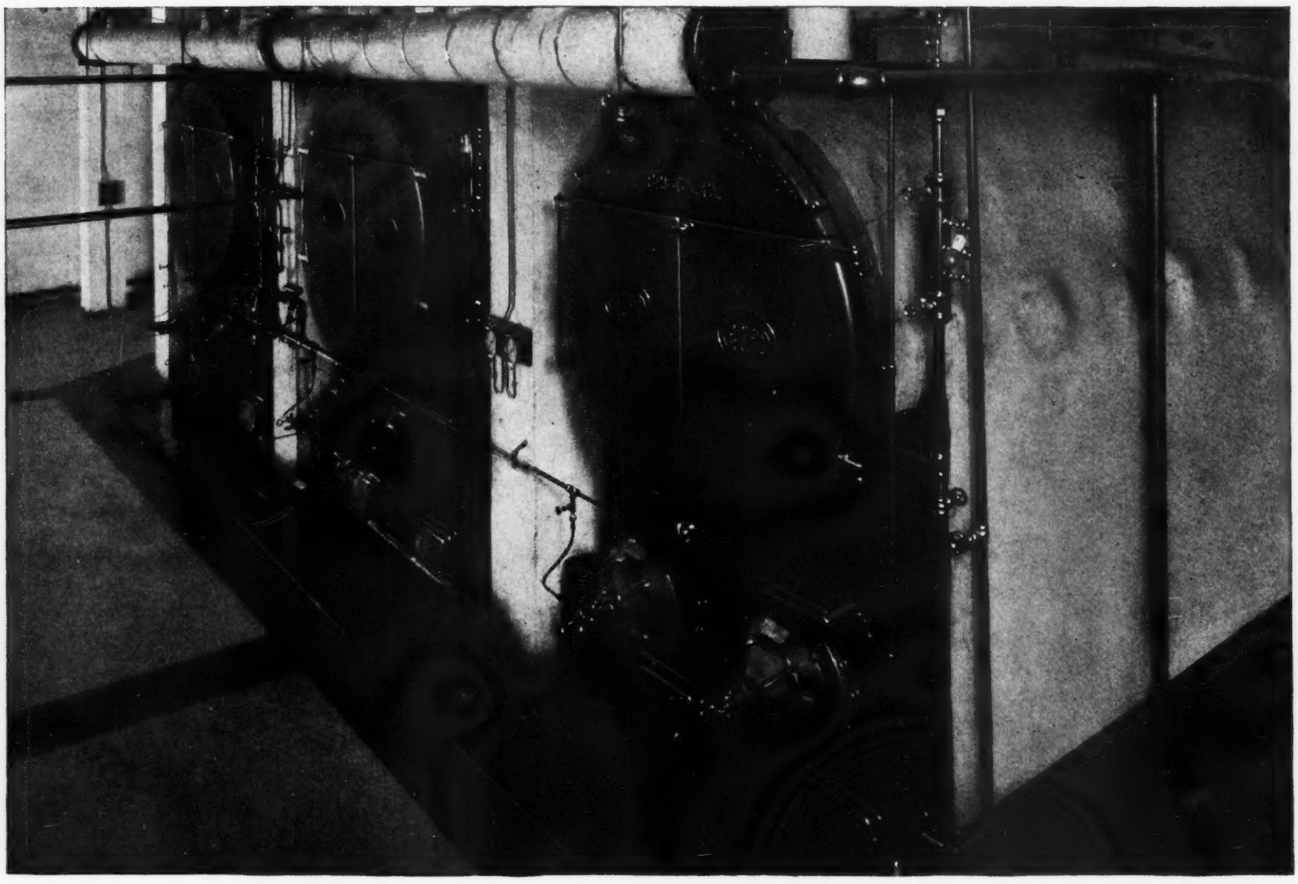
Branches in 40 Principal Cities



In sizes and styles to provide hot water for buildings of any size and every type.

278125

HEATING AND VENTILATING, *formerly* THE HEATING AND VENTILATING MAGAZINE, published by NATIONAL TRADE JOURNALS, INC., at 521 Fifth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents, Vol. XXVI, No. 7, July, 1929. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.



Turner Towers, Eastern Parkway, Brooklyn, N. Y. Architects, Sugarman & Berger; Owners, Turner Bros. Construction Company; Management, H. J. Herbert. Equipped with three oil-fired steam Pacific Steel Heating Boilers of 25,000 sq. ft. capacity each.

PACIFIC

STEEL HEATING BOILERS

Turner Bros. Construction Company, Brooklyn, with 25 years of successful building behind it, set about to outdo itself. The result is the new fifteen-story Turner Towers Apartments on Eastern Parkway, facing Prospect Park, a Brooklyn development akin to Manhattan's Central Park West.

Turner Towers attracts the highest type of tenant. Long leases and individually decorated apartments are the rule. It was therefore obligatory that Turner Bros. provide not only the finest quality in fittings and equipment for each of the 186 apartments, but to see to it that no tenant would ever have cause to complain of inadequate heating. Three oil-fired Steam Pacific Steel Boilers were selected as the best assurance of this tenant satisfaction.

And, as owners of the building, Turner Bros. will never have cause to complain of operating and maintenance costs. Pacific welded construction and Pacific scientific design have long served other buildings with gratifying economy. Turner Towers falls heir to this extra-service.

PACIFIC STEEL BOILER CORPORATION
Factories: Waukegan, Ill., Bristol, Pa.
Sales Offices in 58 Cities
Division of United States Radiator Corporation, Detroit

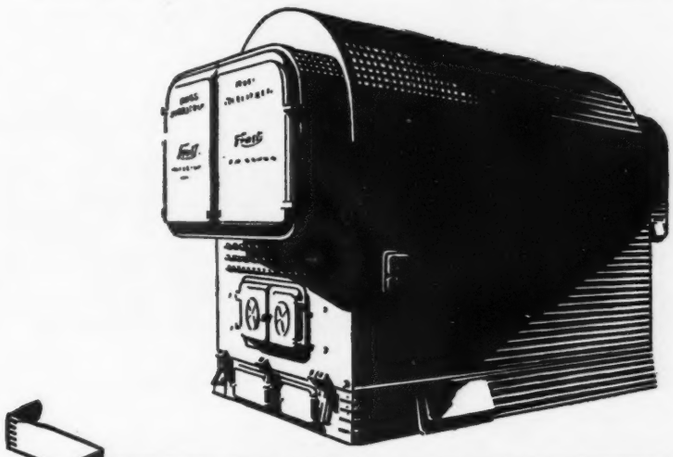
ROSS STEEL BOILERS

Apartments at 96th Street and Marine Ave., Brooklyn, New York. M. Schwirsky, Builder; C. & J. Bender, Heating Contractor. Equipped with one S121 Ross Boiler, net load 8100 sq. ft.

THE newer apartments are installing Ross Steel Heating Boilers because they are engineered so perfectly in building that in operation they function with a maximum of economy and a minimum of care.

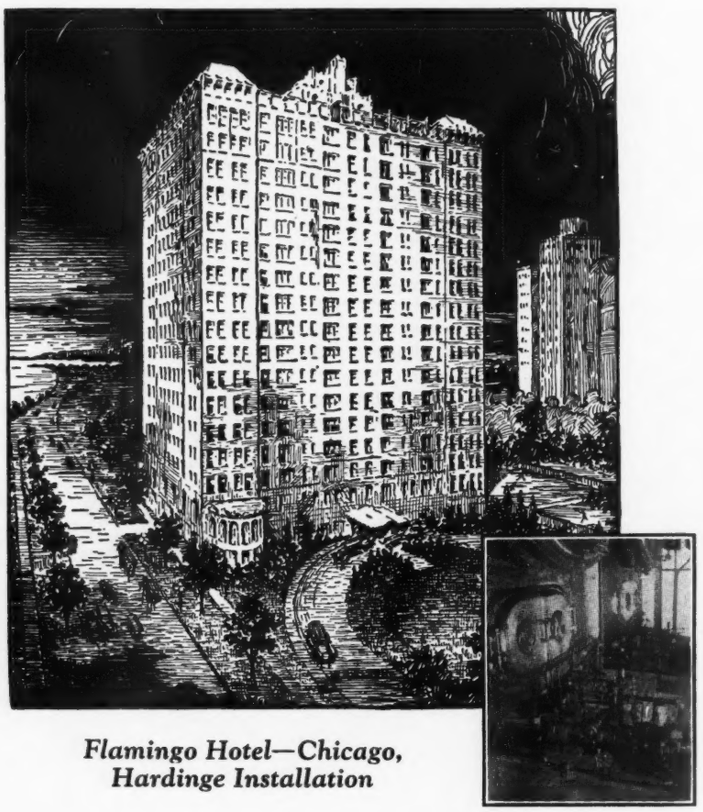
The Frost Manufacturing Co.
SINCE 1851

Branches in most leading cities. GALESBURG, ILLINOIS



THE BOILER•THAT SAVES EXPENSIVE FUEL

An Oil Burner For Every Purse and Purpose



Flamingo Hotel—Chicago, Hardinge Installation

Another one of America's Finest Hotels Equipped with Hardinge

Thirty-eight years of painstaking research and experience in the manufacture of precision-built instruments has brought a nation-wide recognition to the Hardinge line of oil burners. Heating and ventilating engineers are invited to look over the long list of prominent hotels, apartment-buildings, theatres, schools, luxurious homes and small bungalows everywhere which are being efficiently and economically heated with the Hardinge fuel oil burner. Precision-built in 12 different sizes, the Hardinge line of oil burners includes a specific model for every heating need from bungalow to skyscraper. When you specify Hardinge you are specifying ten years of *absolutely guaranteed* oil heating efficiency.

HARDINGE
FUEL OIL HEAT

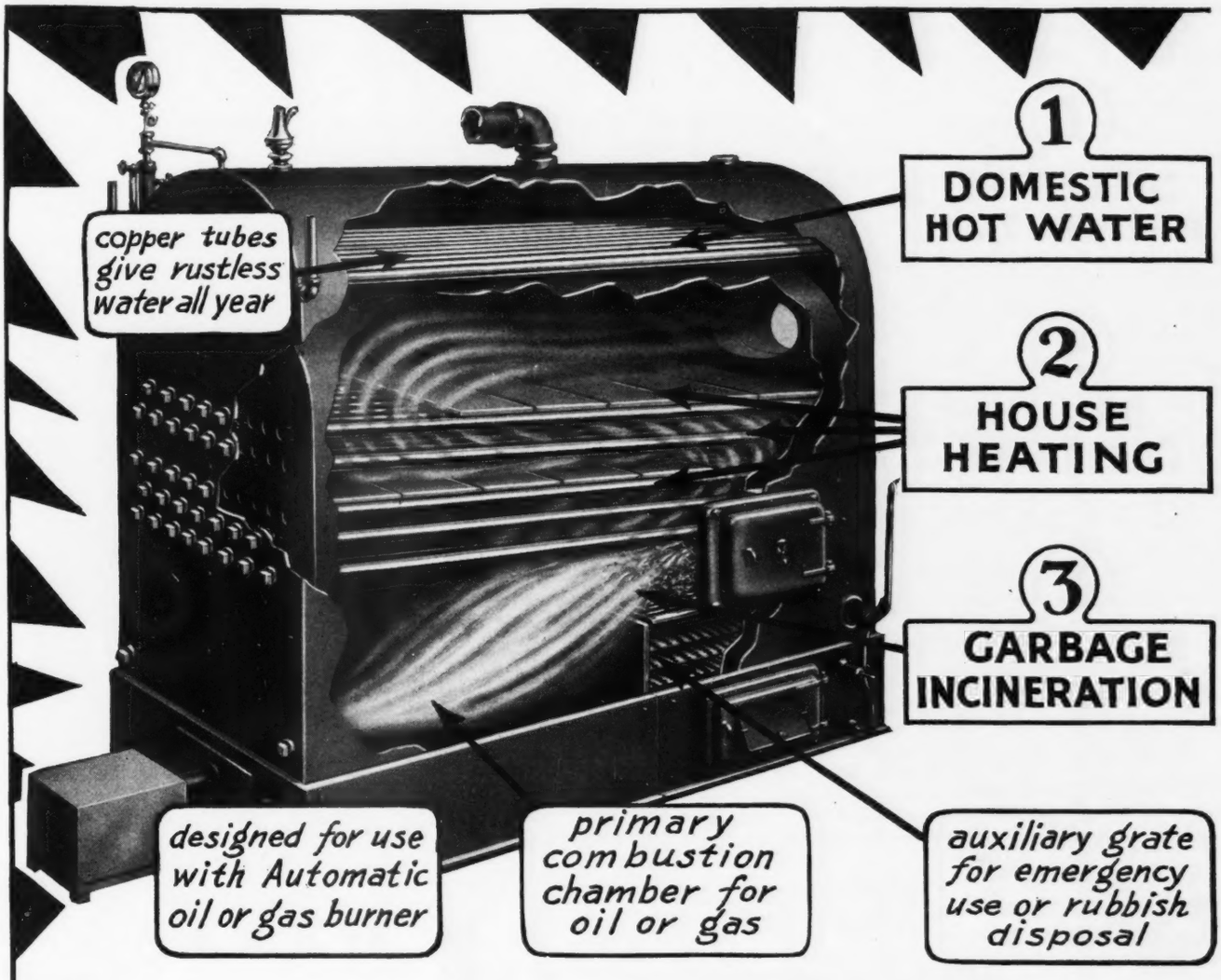
Hardinge Brothers, Inc.

Factory and General Offices

4149 Ravenswood Avenue, Chicago, Ill.

Factory Branches: Chicago—Michigan Avenue at Ohio Street. Boston—843 Beacon Street

TRIPLE SERVICE BOILER


1
DOMESTIC HOT WATER
2
HOUSE HEATING
3
GARBAGE INCINERATION
copper tubes give rustless water all year
designed for use with Automatic oil or gas burner
primary combustion chamber for oil or gas
auxiliary grate for emergency use or rubbish disposal

Remarkable design gives increased heating efficiency in one compact unit

Heat—Domestic Hot Water—Incineration—all in one heating unit. Here is the fullest service in one heating unit—house heating, domestic hot water and garbage incineration. Modern to the highest degree, the Triple Service Boiler operating automatically on oil or gas gives highest efficiency. Dependability, too, is built right in, for should oil or gas service fail, emergency grate can be started with coal or wood.

These boilers are constructed throughout of heavy gauge fire box steel, with electrically welded seams, and are built in strict accordance with the A. S. M. E. Code for 15 lbs. working pressure. The initial cost of the unit is less than the combined prices of separate standard equipment accomplishing the same three operations. Domestic hot water, through copper tubes, is supplied all year, yet the yearly fuel cost will be found lower than a standard boiler alone.

Complete odorless incineration of all combustible refuse is assured because of the location of the grate in the direct path of the flame.

During summer when house heating system is shut off, the hot water service continues, controlled by an Aquastat. The boiler works only long enough to raise boiler water to a temperature that will give plenty of domestic hot water. The life of the boiler is indefinitely prolonged by not shutting it down.

Still another interpretation of triple service is—lower first cost, lower upkeep cost and greater comfort and service.

THE INTERNATIONAL BOILER WORKS COMPANY

East Stroudsburg, Penn., U. S. A.

Thermo-Service, Inc.
Room 1738, 101 Park Avenue
New York City

Heating Equipment Corporation
1194 Commonwealth Avenue
Boston, Mass.

"16° above zero! A fierce northwest wind blowing. Building under construction—workmen constantly entering and leaving. Yet TRIPLE DUTY gave normal heating despite all these conditions."

—FROM AN ACTUAL LETTER

Toronto, Ontario
January 7, 1929

TRIPLE DUTY BOILER CO.,
Detroit, Mich.

GENTLEMEN:

We installed a W 1 D Boiler with water supply, etc., in Mr. W. S. Jury's new home here. It has been fired with coal and now has an oil burner attached. It is not covered yet and the house is under construction with false doors. Workmen are constantly entering and leaving the building, leaving the doors more or less open and we figure that at least 100% more air change goes on than under normal conditions.

* * *

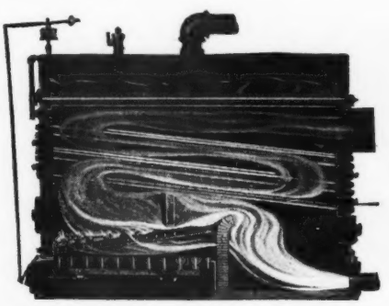
There is a 52-gallon tank attached to this boiler for domestic water supply and 1000 sq. ft. of actual water radiation connected up to it. The baffles are arranged for coal as Mr. Jury has not had time to put in the fire brick baffling for oil burning. Now this boiler has carried this load without the slightest trouble, both with coal and oil.

We started the boiler with the oil burner and in ½ hour the water was up to 160 degrees and the burner then shut off. The temperature was 16 degrees above zero with a fierce northwest wind blowing. This dwelling has no protection as it is right out in a big new subdivision with no buildings near it. Today Mr. Jury arrived at 8 o'clock, the water was at 100 degrees as oil burner had been turned off Sunday night at 10:30 p.m. and a small coal fire placed on the garbage grates in the front combustion chamber to hold over. The oil burner was started and in 20 minutes the water was at 180 degrees. The burner was then shut off and the front chamber filled with shavings and when I got there at 11:00 the temperature on the first floor was 68 degrees and the water at the boiler was 160 degrees. This despité the wind, the cold and the construction conditions; if the house had been completed and occupied, these figures would have been about 72 and 180. **We think your boiler, judging from the wonderful results we have secured with it, is considerably under-rated as to efficiency and that it would carry considerably more radiation than you claim for it.**

VALUABLE TERRITORIES OPEN

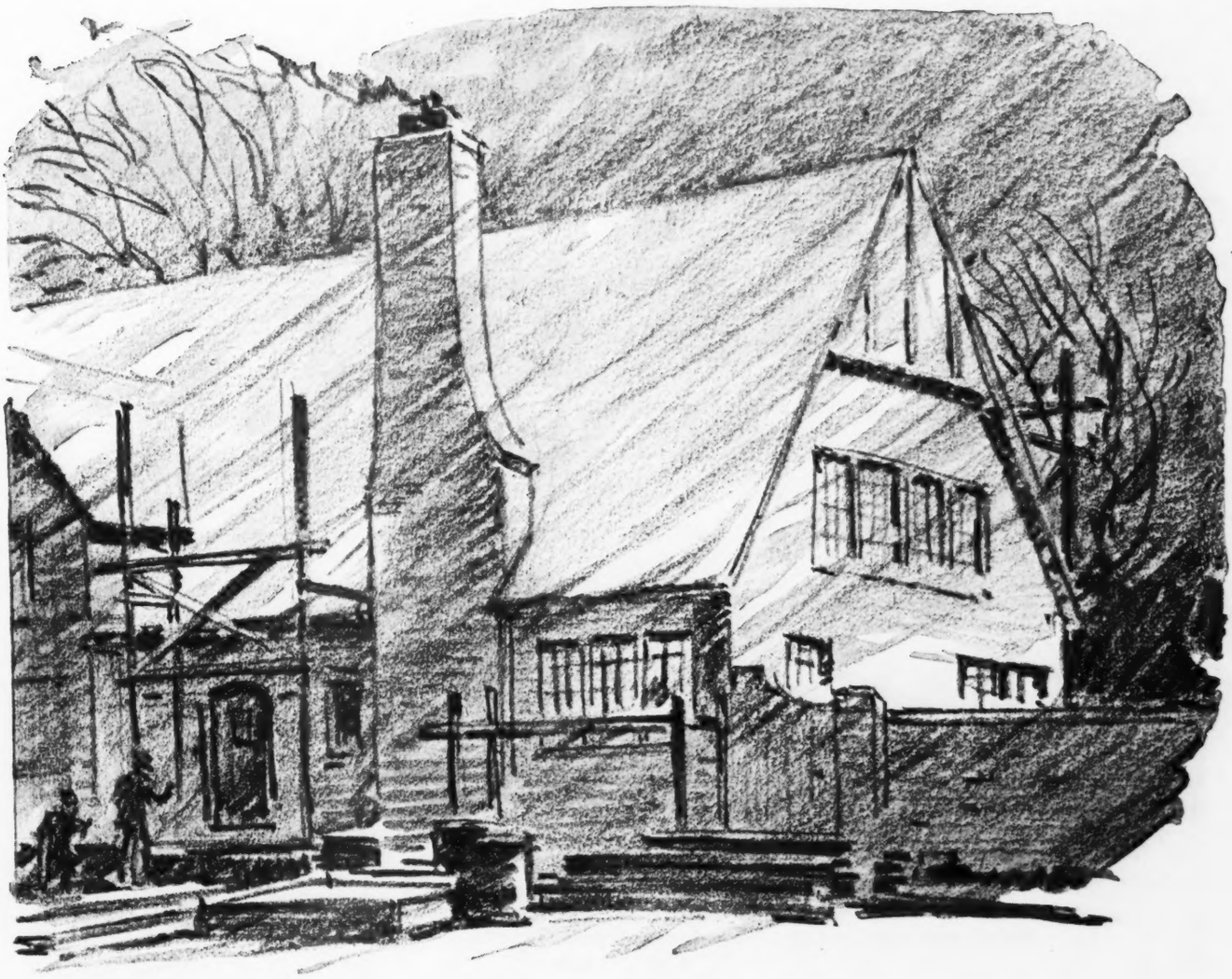
TRIPLE DUTY BOILERS are sold through established channels to the heating trade. TRIPLE DUTY agents are now active in nearly 100 leading cities of United States and Canada. Valuable territories are still open—offering a highly profitable opportunity to live, experienced heating specialty men. Write for details.

1 HEAT



The steel water tube construction and long flue travel of Triple Duty make it an ideal oil or gas burning boiler. University tests show efficiency in excess of 75%. The double combustion chamber permits the use of coal, oil or gas fuel singly or in combination, the change from one fuel to another can be accomplished without major mechanical adjustments.

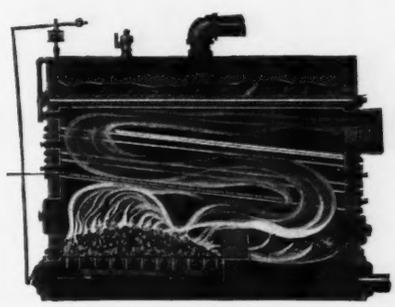
TRIPLE DUTY



2 SUPPLY HOT WATER

The built-in hot-water supply system of the Triple Duty eliminates the separate hot water system which all too often operates inefficiently. Lower priced fuel—more efficiently burned—thus reduces hot water expense to a mere fraction of the usual cost. Ample quantities are available during both winter and summer operation.

3 INCINERATE AT A PROFIT



Triple Duty eliminates both the installation and operating expense of a separate incinerator. It incinerates by the scientific method of dehydration. The heat generated by the burning refuse is used by the boiler—no gas fuel expense is incurred and incineration actually performed at a profit.

BOILER COMPANY, 2005-7 Fisher Bldg., Detroit

The Dunham Differential Vacuum Heating System

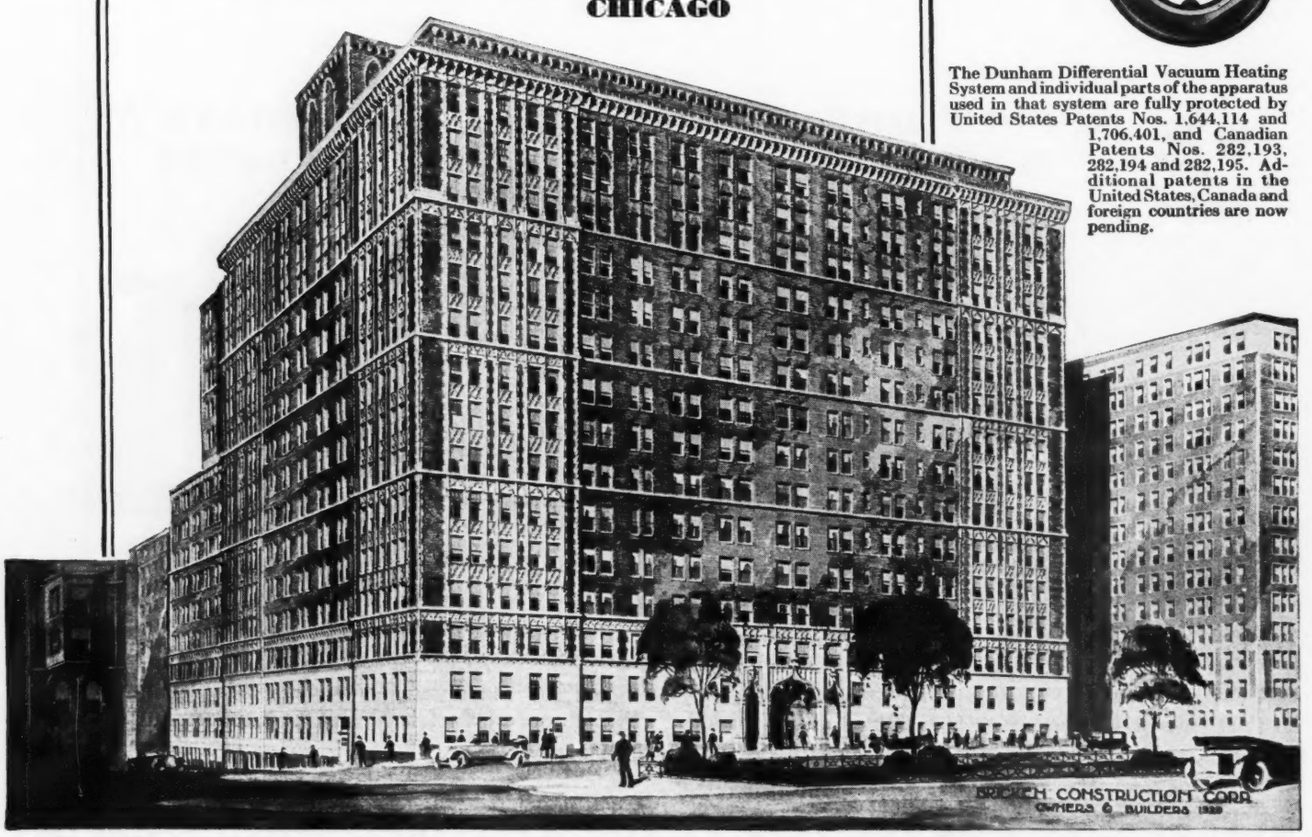
is installed in the 1185 Park Avenue Apartments, New York

THIS outstanding New York apartment building will be heated with a Dunham Differential Vacuum Heating System. The owners of this 15 story structure chose this System as offering the utmost satisfaction to tenants and greatest economy of fuel. "Cool" steam will be circulated in the building's 1650 radiators in mild weather, "hot" steam in cold weather.

This imposing six million dollar structure occupies an entire block on Park Avenue, on the crest of Carnegie Hill, from 93rd to 94th Streets. Its 6, 7, 8 and 9 room suites will be grouped around the beautiful formal garden about which the building is erected. Duplex and roof garden apartments of 11 rooms are also provided. Gothic architecture distinguishes the facade of this structure; limestone is used for the lower stories, with combination face brick and terra cotta above.

Needless to state, the 1185 Park Avenue Apartments will be ultra-modern in every detail of equipment, lavish in decorative beauty and designed throughout for the utmost comfort and convenience of its occupants. The entrance halls and vestibules are decorated in special period design and are executed by Hoffstatter, working in cooperation with Schwartz & Gross.

C. A. DUNHAM CO.
***Dunham Building*, 450 East Ohio Street**
CHICAGO



1185 Park Avenue Apartments

Bricken Construction Corporation, Owners and Builders. Jarcho Bros. Inc., New York City, Heating Contractors. Schwartz & Gross, Architects, New York City.

Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

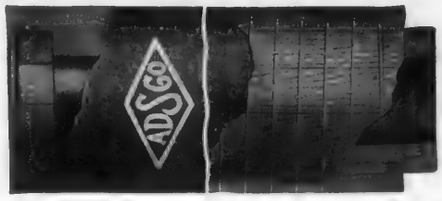
Look for the name DUNHAM

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap.

The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,706,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

Specialists in District Heating

Equipment for Underground Steam Lines



ADSCO DUPLEX-SLEEVE GUIDED EXPANSION JOINT
For pressure up to 500 lbs. and temperature to 750 degrees F. Air-cooled slip eliminates excessive packing and maintenance costs and assures a tight joint.

Packard Motor Company Practices What It Preaches

In the selection of expansion joints for service on their pipe lines Packard Motor Company must have figured that the best insurance against trouble would be the best expansion joints—they chose ADSCO.

ADSCO Expansion Joints—now in use on fully 90% of the country's great District Heating installations—have an established record for long service, care-free performance. You buy them with examples by the dozens of ten, fifteen and twenty years unbroken underground service to lend confidence to your judgment.

From a complete range of sizes and types you can obtain exactly the right design for your installation. There's an ADSCO Expansion Joint for every requirement of service in conveying steam, gas, oil, water or any other liquid.

For complete information on ADSCO Expansion Joints send for the ADSCO Reference Book. Use the coupon below.

ADSCO Engineers Are At Your Service

The broad experience of ADSCO Engineers embraces every phase of pipe line construction from planning to installation. Feel free to call upon them for advice on any contemplated work. They will give you unstinted co-operation.

AMERICAN DISTRICT STEAM COMPANY

NORTH TONAWANDA, N.Y.

to be sure of getting

ADSCO

EXPANSION JOINTS

Order Direct

The First Step is to get this BOOK

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N.Y.

Please send me free your new book "Reference Data on Expansion in Pipe Lines."

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ADDED YEARS OF SERVICE *in- skyscraper bungalow and factory*

THE life of pipe in most cases is a matter of its ability to resist some form of corrosion. Different kinds of services are, of course, affected by different types of corrosion. One of the worst types is pitting. It is a proven fact that mill-scale on the pipe is one of the principal causes of pitting. The scale is electronegative to the pipe metal and sets up galvanic action (corrosion).

The Scale Free Process, which is applied to NATIONAL Pipe, butt-weld sizes ½ to 3-inch, was invented and developed by National Tube Company to eliminate this mill-scale, common to all butt-weld pipe in the normal processes of manufacture.

In addition to giving added protection against pitting tendencies, NATIONAL Scale Free Pipe means a better base for galvanized coatings; full delivery capacity; no damage to valve seats, no clogging of small orifices by loose scale; and approximately 20 per cent greater strength at the weld, due to additional rolling, making the pipe especially desirable for bending, coiling and special uses.

For additional protection against atmospheric corrosion, NATIONAL Copper-Steel Pipe is particularly advantageous for soil, waste, vent lines and rain leaders. Steel containing a small percentage of copper makes it especially resistant to this type of corrosion. The Scale Free Process and the development of Copper-Steel Pipe have contributed in making NATIONAL—

America's Standard Wrought Pipe

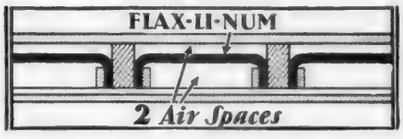
(Ask for Bulletins No. 7—Scale Free Pipe—and No. 11—Copper-Steel Pipe)

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

SCALE FREE PIPE

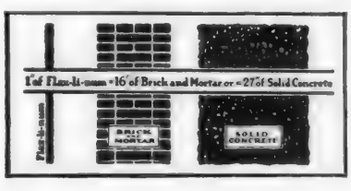
Flax-li-num

Through Its Two-Air-Space Method of Application, Gives the Greatest Possible Return in Insulating Value from an Economical Thickness of the Material . . .



THE principle of securing additional insulating value from FLAX-LI-NUM, by installing it in the middle of the air space between the inner and outer walls, is fundamentally and scientifically correct. Tests by the U. S. Bureau of Standards prove that such an application increases the insulating efficiency of FLAX-LI-NUM 50% . . making possible greater protection from an economical thickness of material.

FLAX-LI-NUM fits snugly between the studs (see diagram), forming a wall-within-a-wall. In this way a double resistance to escaping or entering heat is created . . and the insulating value of the wall is increased by at least one-half. Of this type application the U. S. Bureau of Standards says in their letter Circular No. 227, "The addition of one-half inch layer of material in the middle of the air space is equivalent to about three-quarter inch layer at some other place in the wall." In no other way can such effective results be achieved . . in no other way can an economical thickness of material yield the maximum protection and fuel economy. The FLAX-LI-NUM Manual contains full information on this remarkable material and method. If you do not already have a copy in your files, we will be pleased to send one for your ready reference.

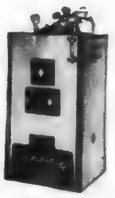


FLAX-LI-NUM INSULATING CO., *St. Paul, Minn.*

Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL

St. Paul, Minnesota HV-7
FLAX-LI-NUM INSULATING CO.
Send me complete information about Flax-li-num. Also facts about the "two-air-space" method.
Name.....
Address.....
City..... State.....



PAGE FOR GREATER BOILER VALUE

Page makes boilers in a wide range of capacities, suitable for efficient, economical heating of residences, churches, schools—any buildings, large or small, to be heated by steam, vapor or hot water systems.

The Page Red Diamond Jacketed Boiler and the Volunteer Round Boiler, for residences, assure Summer warmth within the house when Jack Frost reigns outside.

The Monarch Square Sectional Boilers, in the 22″, 28″ 40″ and 60″ Series, offer an unusual range for the selection of a boiler that will fit in perfectly with almost any heating plant you are called upon to design.

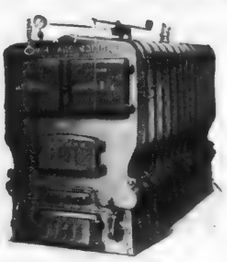
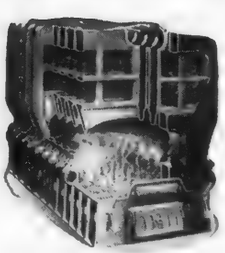
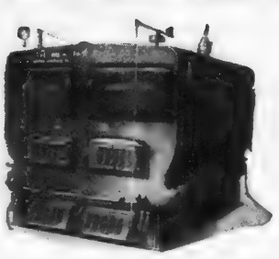
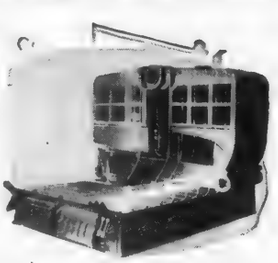
More grate area,—more heating surface—more boiler for each dollar of expenditure. Plenty of heat at a low fuel cost. You will be pleased with their performance.

Send for catalogue No. 55.

The Wm H Page Boiler Co

200 Madison Ave., New York, N. Y.

Branch Offices and Warehouses:
Boston, 123 Beverly St.
Philadelphia, 1126 Washington Ave.
Cleveland, Rose Building
Washington, 1117 - 15th St., N. W.
Baltimore, 502 St. Paul St.
Factory: Meadville, Pennsylvania

NAMES MAKE NEWS
they say . . . Well then, here is some News about KLEEN-HEET

MRS. IDA V. STERNER, *Allentown, Pa:*—"The Kleen-Heet burner we have installed in our residence at Cedar Bluff has certainly operated up to all the statements made for it. * * * We have not required any extra service, and compliment your firm. * * * "

GEORGE A. SIDEBOTHAM, *Albany, N. Y.:*—"The comforts of a Kleen-Heet Oil Burner are indescribable. It has been our pleasure to enjoy one of the Kleen-Heet Burners this winter and has proved satisfactory to us as a good heater and a great labor-saving device."

SAMUEL C. DROOZ, *Albany, N. Y.:*—"I wish to state that my oil burner is very satisfactory and I would never have coal in the house again. * * * I would be glad to recommend the Kleen-Heet burner to anyone who is contemplating making a change."

O. W. HOWARD, *Albany, N. Y.:*—"I am writing this letter as the result of the complete satisfaction I have received with your Kleen-Heet Challenger oil burner, as well as the wonderful service you have tendered me. * * * If I could not get another heater from you, I would not take three times the price for it. * * * * "

REV. L. A. LAVIGNE, PASTOR OF ST. JOSEPH'S CHURCH, *Cohoes, N. Y.:*—"It is the first season—1928-1929—we are using four of your new No. 800 Kleen-Heet Burners, and I must say, in all sincerity, that we have been highly satisfied with them. They are very efficient in producing heat and are very quiet."

MRS. JAMES MOORE, *North Troy, N. Y.:*—"I am very well pleased with the Kleen-Heet Burner. It is all you said it was. I am sure anyone who will put one in their home or store will be pleased."

IRA PRICE, *Albany, N. Y.:*—"Please accept this letter as an acknowledgment of the square deal I received from you and the interest you have taken in my Kleen-Heet Burner. I can truthfully say that I am more than pleased with the Kleen-Heet Burner in saving time and fuel."

N. J. PATTERSON, *Albany, N. Y.:*—"I can assure you that I have been highly pleased with my Kleen-Heet Challenger Oil Burner and also the splendid system which you have employed in connection with the installation and maintenance of same. I can further assure you that I will be very glad to give a personal interview to any one of your prospective purchasers of said burner. * * * "

MRS. F. EARL KUNKER, *Albany, N. Y.:*—"I must say my Kleen-Heet is a treasure to me * * * It has been the healthiest winter we have seen on account of our burner which has kept the house at an even temperature."

C. A. HOCHSTRASSER, *Albany, N. Y.:*—"This winter my house has been more comfortable than any previous season. * * * I find the burner economical, reliable and practically noiseless. * * * I can heartily recommend this burner to anyone desiring cleanliness, freedom from drudgery and trouble that goes along with coal burning furnaces."

TODAY our dealers are making record sales—and record PROFITS *with*

Kleen-Heet

Winslow Boiler & Engineering Company

844 Rush Street, CHICAGO

11 West 42nd Street, NEW YORK GALESBURG, ILL.

COIL STEEL BOILERS

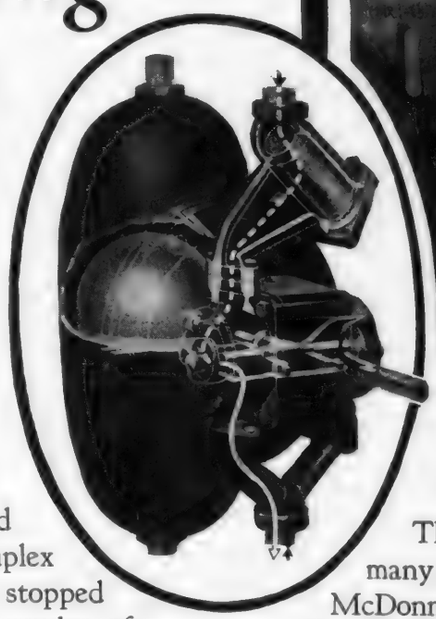
FOR OIL BURNING

The quality built into a Coil Steel Boiler reflects itself in the added years of service which the boiler will give. Coil Steel Boilers are not being recommended and specified by hundreds of heating contractors because of any lower original price. Quality has always been the deciding factor. Yet Coil Boilers are more economical in the long run. They save money by—giving better service—using less fuel—lasting longer—and requiring less attention. Use them for every oil heating job.

MONITOR BOILER COMPANY

1505 Race Street :: :: Philadelphia, Pa.

There are times when only a *self-cleaning* feeder is *safe*



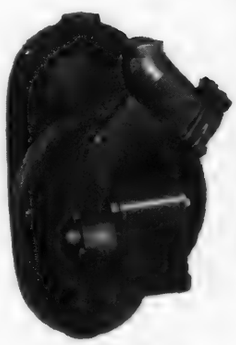
YOU probably realize that no heating boiler is properly protected until it is equipped with a duplex feeder. But have you ever stopped to consider the fact that a number of conditions are met by only *one* feeder?

Where feed water is particularly hard, for instance, it is doubtful whether any feeder can cope with this condition except the feeder with "the valves that stay new"—the feeder with the rotary, self-grinding valves. And it is certain that if the current to the condensation pump fails, only the feeder with capacity enough to supply the requirements of *any* heating boiler is *entirely safe*.

These are only two of the many outstanding features of the McDonnell & Miller Self-Cleaning Duplex Feeder, but they are characteristic of the refinements that place it in a class of its own—refinements like adjustable water level and adjustment in differential between valve openings.

When you install or specify such a feeder you *play safe*. Also remember that our unconditional guaranty for a full year shifts the responsibility from you to *us*.

Where shall we send our booklet covering capacity curves and similar data? Tell us on the coupon below.



Also made with single valve

Feeders built to the same high standard that is found in M. & M. Duplex Feeders are made with a single valve of the rotary, self-cleaning type. Ask for special bulletin covering this feeder.

McDONNELL & MILLER
710 Wrigley Bldg., Chicago

McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"

McDonnell & Miller,
710 Wrigley Bldg., Chicago
Please send a copy of your 8-page booklet to:
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City & State
HV 7

Brownell

U N D E R F E E D

Stoker's

Pay For Themselves Out of the Savings

Why buy good coal only to waste it on hand-firing, or install a high grade boiler only to throttle its efficiency with a coal shovel?

Underfeed firing is the modern, money-saving way and it is the Brownell way.

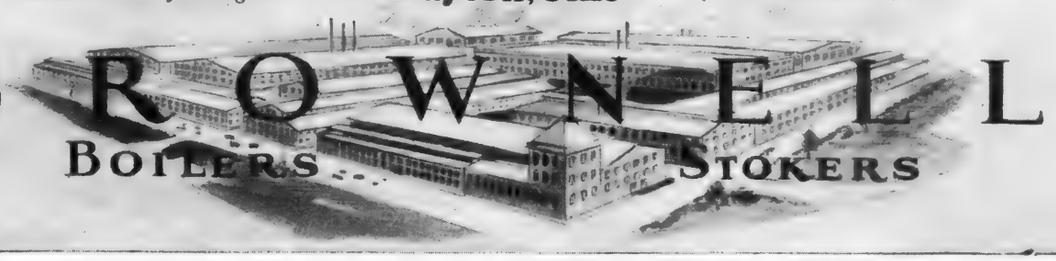
Brownell Underfeed Stokers may be installed under old or new boilers of any type or capacity. Plants so equipped burn the cheapest of coal, slack, screenings, or buckwheat, saving money on price. They require less of that cheap coal to maintain the pressure; also save on tonnage. In addition, they materially reduce boiler room labor—another economy.

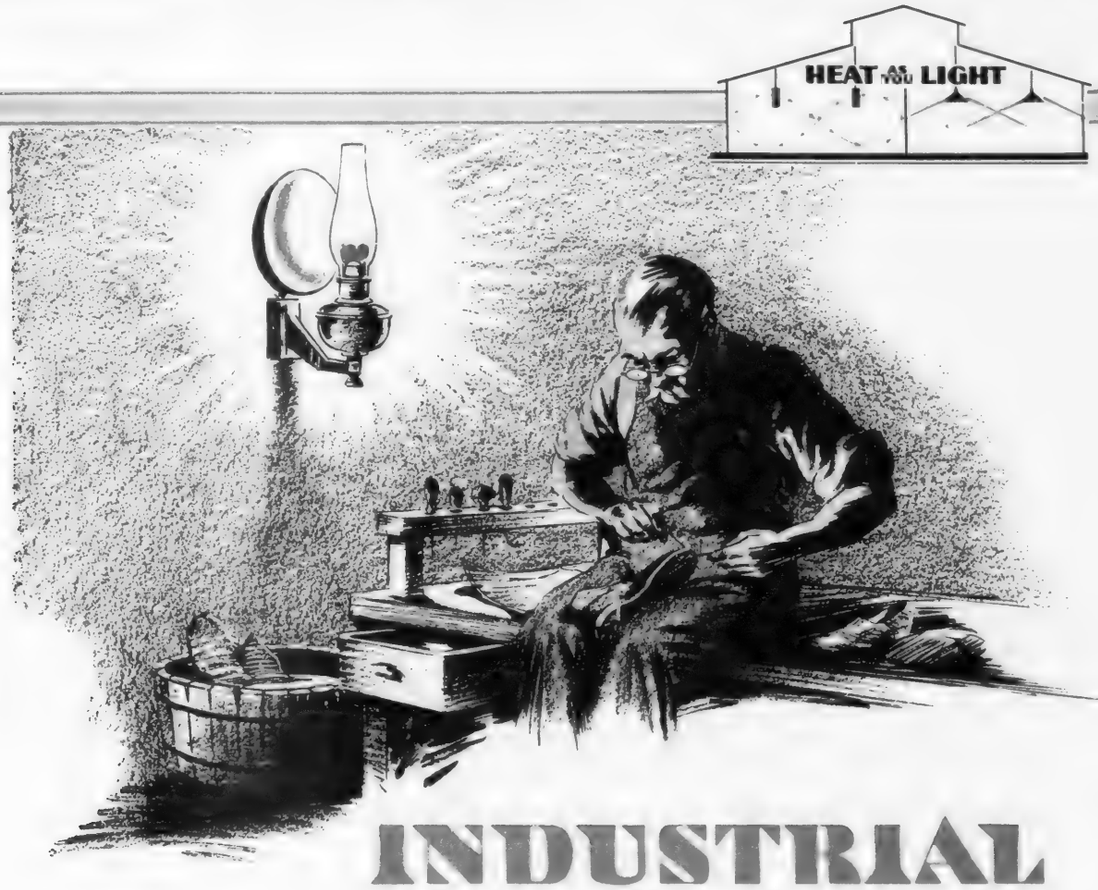
Brownell Underfeed Stokers operate on the forced underfeed principle whereby the proper mixture of coal and air is constantly and automatically fed, thereby obtaining a uniform temperature, or boiler pressure, as well as effecting the economies on fuel and labor just referred to. They also eliminate smoke and enable the owner to observe his local smoke ordinance.

The Brownell line is complete—contains the particular type and size stoker individual requirements demand. Write for Bulletin S-50.

The Brownell Company

Established 74 years ago **Dayton, Ohio** *Offices almost everywhere*





INDUSTRIAL HEATING

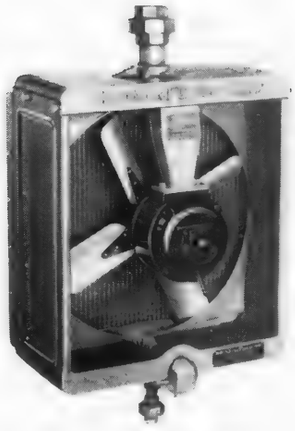
of yesterday is as out-of-date *as the* OIL-LAMP

THE oil lamp, with its feeble glow, its restricted area of effectiveness, its shadows, its countless limitations—who would accept this type of industrial lighting?

Yet some heating methods—still used—are but little less out-of-date than the oil lamp. The Modine way is the modern way. It floods the working zone with comfortable heat—no cold spots, no cold floors, no overheated areas.

Modines direct the heat down where it is needed just as light is reflected down. They are individually controlled and instantly operated. They are easily installed for they are suspended from the steam line — over head, out of the way.

Ask your heating contractor about Modine Unit Heaters or write for our new Catalog.



Modine Unit Heater Model No. 701 — weighs only 130 lbs. — replaces more than 2 tons of cast iron radiation.

MODINE MANUFACTURING COMPANY
1707 RACINE ST. *(Heating Division)* RACINE, WIS.
Branch Offices in All Large Cities.
London Office: S. G. Leach & Co., Ltd., 26-30 Artillery Lane.

Modine *Unit* HEATER

A MODINE Product

FOR STEAM, VAPOR, VACUUM, HOT WATER HEATING SYSTEMS

An Eastern silk mill where they "heat as they light".

Mullins Body Corp. Salem, O. Over 100 Modine Units installed in their various plants.

The Original UNIT HEATER

Suspending from the Steam Line

MODINE Unit Heaters are installed overhead — up out of the way as shown above.

They suspend from the steamline.

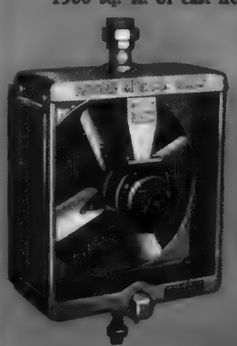
Because of this method of installation, Modine heaters may be rotated to face in any direction by simply loosening unions in the supply and return lines. Movable deflectors on the front of the Modine provide vertical directional control of the heated air stream.

Let us send you complete facts about Modine Unit Heaters now.

MODINE MANUFACTURING COMPANY

1707 RACINE ST. *(Heating Division)* RACINE, WIS.

Modine Unit Heater—Model 1401—300 lbs. Delivers 320,300 B. t. u. per hr. at 60° entering air—5 lbs. steam press. Replaces approx. 1300 sq. ft. of cast iron radiation.



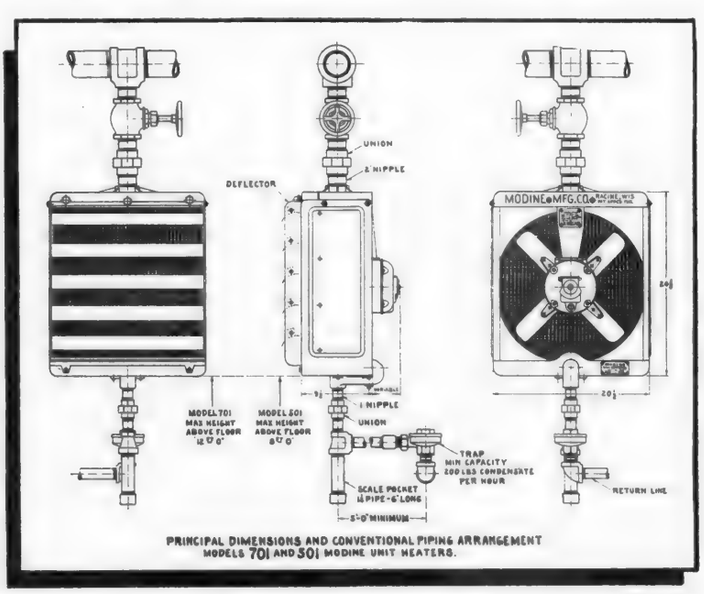
Modine Unit Heater—Model 301—75 lbs. Delivers 61,000 B. t. u. per hr. at 60° entering air—5 lbs. steam press. Replaces 300 sq. ft. of cast iron radiation.

Modine Unit Heater—Model 153—40 lbs. Delivers 42,500 B. t. u. per hr. at 60° entering air — 5 lbs. steam press. Replaces approx. 150 sq. ft. of cast iron radiation.

Modine *Unit* HEATER

A MODINE Product

FOR STEAM, VAPOR, VACUUM, HOT WATER HEATING SYSTEMS



PRINCIPAL DIMENSIONS AND CONVENTIONAL PIPING ARRANGEMENT MODELS 701 AND 501 MODINE UNIT HEATERS.

THE
KAY
GATE VALVE
Recommended for
125 LBS.
Working Steam Pressure

EVERY WALWORTH VALVE
IS INDIVIDUALLY TESTED

The "Kay" Brass Gate Valves are of the double disc parallel seat design, and are so constructed that the discs do not bear on the seats in opening or closing. The discs are seated by a wedge which bears on the center of the discs. This wedge is brought into action by a lug on the bottom of the valve body just before the discs reach their lowest position. It is likewise released at the very instant of starting to open the valve. The discs are thus free from the seats while being opened or closed.

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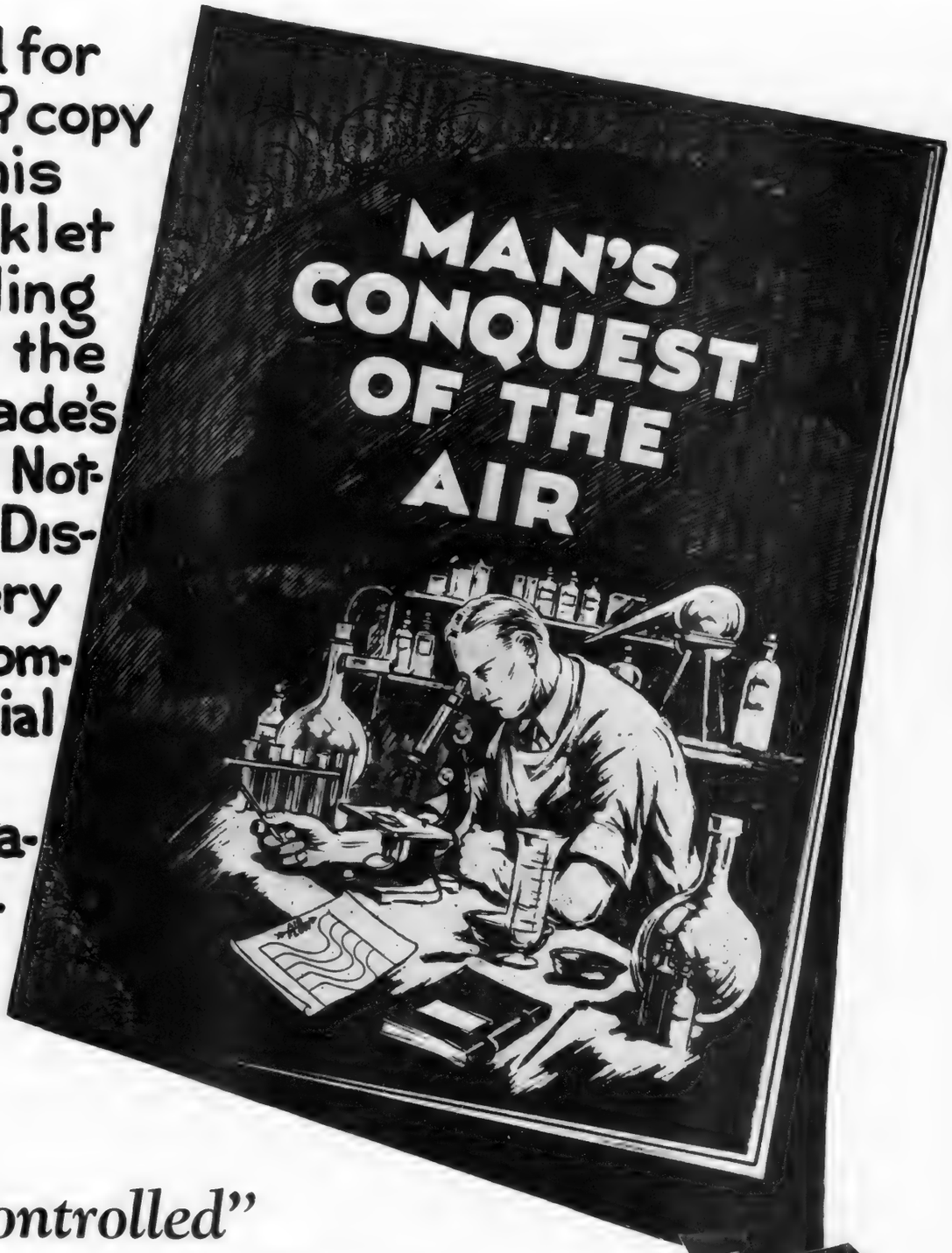
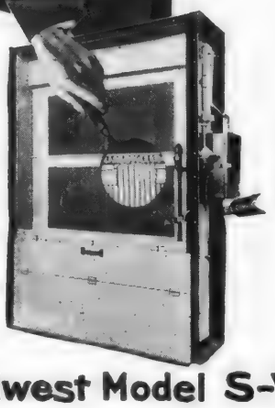
Send for *YOUR* copy Of this Booklet Dealing With the Decade's Most Notable Discovery In Commercial Air Filtration.



"Controlled" Sinuous Air Flow—

Now makes possible air filters of considerably smaller size and greatly increased capacity. Savings in space, sheet metal work, etc., are of such importance as to recommend themselves to architects and ventilating engineers everywhere. The above booklet, describing this new filtering principle in detail, will be sent to interested parties upon request.



Midwest Model S-V

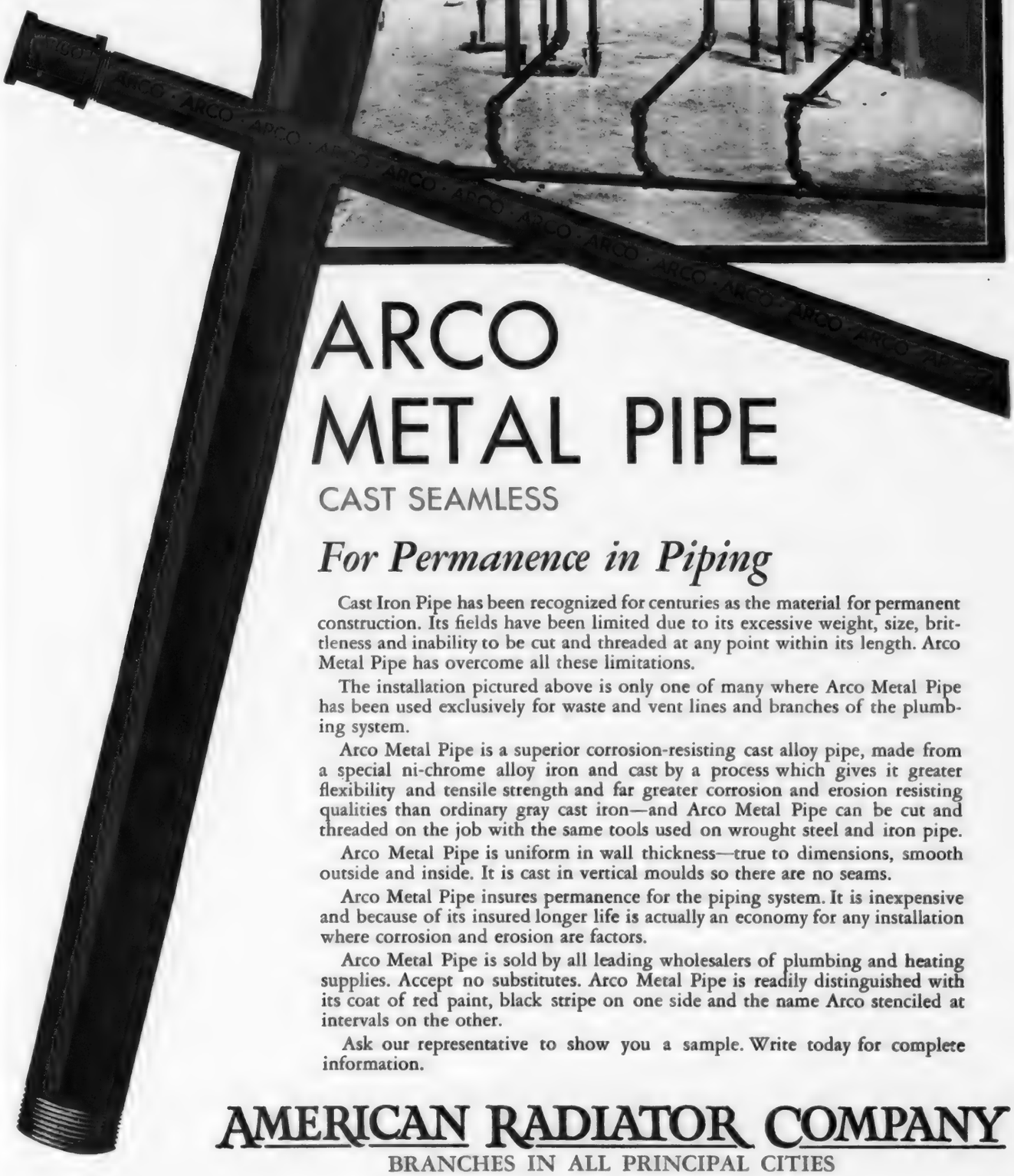
MIDWEST AIR FILTERS INCORPORATED

BRADFORD, PA.

Licensed Under American Air Filter Patents

This photograph shows the installation of Arco Metal Pipe waste and vent lines in the new Armour-Gillis home, Kansas City, Mo. This pipe was cut and threaded on the job.

GEO. R. JORGENSON CO.,
Plumbing & Heating Contractors
KEENE & SIMPSON, *Architects*
WALTER E. GILLHAM, *Engineer*



ARCO METAL PIPE

CAST SEAMLESS

For Permanence in Piping

Cast Iron Pipe has been recognized for centuries as the material for permanent construction. Its fields have been limited due to its excessive weight, size, brittleness and inability to be cut and threaded at any point within its length. Arco Metal Pipe has overcome all these limitations.

The installation pictured above is only one of many where Arco Metal Pipe has been used exclusively for waste and vent lines and branches of the plumbing system.

Arco Metal Pipe is a superior corrosion-resisting cast alloy pipe, made from a special ni-chrome alloy iron and cast by a process which gives it greater flexibility and tensile strength and far greater corrosion and erosion resisting qualities than ordinary gray cast iron—and Arco Metal Pipe can be cut and threaded on the job with the same tools used on wrought steel and iron pipe.

Arco Metal Pipe is uniform in wall thickness—true to dimensions, smooth outside and inside. It is cast in vertical moulds so there are no seams.

Arco Metal Pipe insures permanence for the piping system. It is inexpensive and because of its insured longer life is actually an economy for any installation where corrosion and erosion are factors.

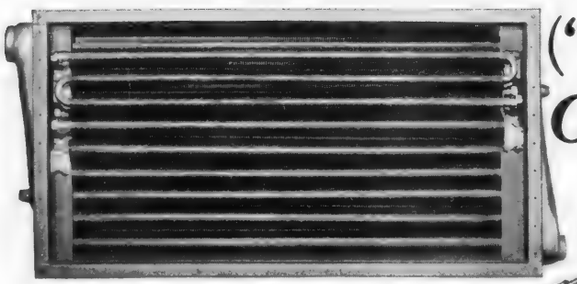
Arco Metal Pipe is sold by all leading wholesalers of plumbing and heating supplies. Accept no substitutes. Arco Metal Pipe is readily distinguished with its coat of red paint, black stripe on one side and the name Arco stenciled at intervals on the other.

Ask our representative to show you a sample. Write today for complete information.

AMERICAN RADIATOR COMPANY

BRANCHES IN ALL PRINCIPAL CITIES

—and in Patrick T. ("Paddy") Harmon's new Chicago Indoor Stadium



Largest in the World

Hall, Lawrence & Ratcliffe, Inc., Architects — H. A. Durr & Company, Engineers — Carrier Engineering Corporation, Air Conditioning — Buffalo Forge Company, Fan System Apparatus

it is

AEROFIN

(The Standardized Light-Weight Fan System Heat-Surface)

that insures the Comfort of the Millions who will find Play and Pleasure in this great Structure, thruout the Winter

AEROFIN is selected by foremost Architects and Engineers for the Nation's most notable Buildings because it was developed specifically to meet their every requirement, not only, but to inspire their genius by its remarkable adaptability, its light-weight and its extraordinary compactness, while satisfying fully their primary demand of utter reliability.

There are three types, AEROFIN (Low Pressure), AEROFIN (Universal), AEROFIN (High Pressure), and 128 standardized encased Unit sizes, for pressures up to 350 lbs. gauge.

Ask Newark for Bulletin V-79

AEROFIN CORPORATION

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AEROFIN is sold only by Manufacturers of nationally advertised Fan Heating Apparatus

YOU TALK RESULTS *when you talk* hiJet

For the economical distribution of heat in
Factories
Railroad Shops
Roundhouses
Warehouses
Mills
Garages
Gymnasiums
and all industrial buildings, as well as in special process rooms where uniform heat maintenance is required.

The sales success of the Herman Nelson hiJet Heater has been built on quality—results—downright fitness for its job. That's why more and more progressive heating contractors are eliminating heating troubles and making better profits by selling hiJet. It's simply *good business*.

The hiJet Heater is made in three sizes—all easy to install. It uses the Herman Nelson Radiator which has no brazed, welded, soldered or expanded joints to fail or leak in service. Operating steam pressures from 1 to 150 pounds.

A specially designed motor, the Her-Nel-Co, permits simple speed control with minimum running current. In operation, the hiJet directs a jet of warm air downward, dispelling the cold air strata at the floor line. The results of a hiJet installation are constant, uniform heating—flexibility—freedom from trouble and repair.

Get all the facts about the hiJet. Mail the coupon for catalogue.

Richman Brothers Bldg., Cleveland, Ohio
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Manufactured only by THE HERMAN NELSON CORPORATION, *Moline, Ill.*
Builders of Successful Heating and Ventilating Equipment Exclusively for Over 20 Years

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The HERMAN NELSON
hiJet
TRADE MARK
HEATER

GET FREE BOOK

THE HERMAN NELSON CORPORATION
Moline, Illinois

Gentlemen:
Please send me book No. 12 containing the facts about Herman Nelson hiJet Unit Heater.

Name..... *Firm Name*.....
Address..... *Type of Building*.....

A good word for Electrol

is worth Money *to* You!

IF YOU know about Electrol—and every heating contractor does—then you are sold on automatic oil heat. Now, your good opinion of Electrol can be made to pay dividends to you.

As the homes of your customers are heated by oil, you can develop a new source of income . . . You can team up with the local Electrol dealer and add new profits to your present business.

No investment is required—no increase in overhead or equipment. All you need is to work with the Electrol dealer. You will find him a competent, well-established business man who will respect your professional judgment and cooperate with you fully. He will take care of all installations and service work.

The Electrol Sales and Service Representative in your city will be glad to explain all details. If you don't know him, write us and we will have him get in touch with you.

ELECTROL INCORPORATED
177 Dorcas St. St. Louis, U. S. A.

ELECTROL

The* OIL BURNER *with the Master Control

LISTED AS STANDARD BY THE UNDERWRITERS' LABORATORIES

The Bishop & Babcock line includes, Vacuum and Vapor Low Pressure Heating Specialties; a complete system of Automatic Temperature control; Massachusetts Squirrel Cage Fans; Air Washers and Unit Heaters

Announcing The New MASSACHUSETTS Unit Heaters

MANUFACTURED by an organization established fifty years and recognized as builders of highly efficient heating and ventilating equipment.

Massachusetts Unit Heaters are built in both ceiling suspension and floor mounting types, in all sizes and in two widths, 18 and 30 inch, utilizing either steam or hot water.

The floor type in the 18 inch width answers the demand for a Unit Heater that will occupy a minimum amount of floor space. The high capacity model in the 30 inch width in both the floor mounting and the ceiling suspension types delivers as much as 14,000 cubic feet of air per minute with correspondingly high heat outputs.

Modern engineering has been applied throughout in the design of these Units. Whipping of the long shaft, a common occurence in ordinary Unit Heaters has been entirely eliminated. Careful dynamic balancing of the wheel assembly prevents destructive vibration. Arcoblast copper fin radiation designed for 200 pounds working pressure is used exclusively in these Heaters.

Our nearest sales or service office will gladly furnish full details of all types and their applications. Send for Bulletin No. 58.

The BISHOP & BABCOCK SALES COMPANY, Cleveland, O.

General Offices—4901-4915 Hamilton Avenue, N. E.

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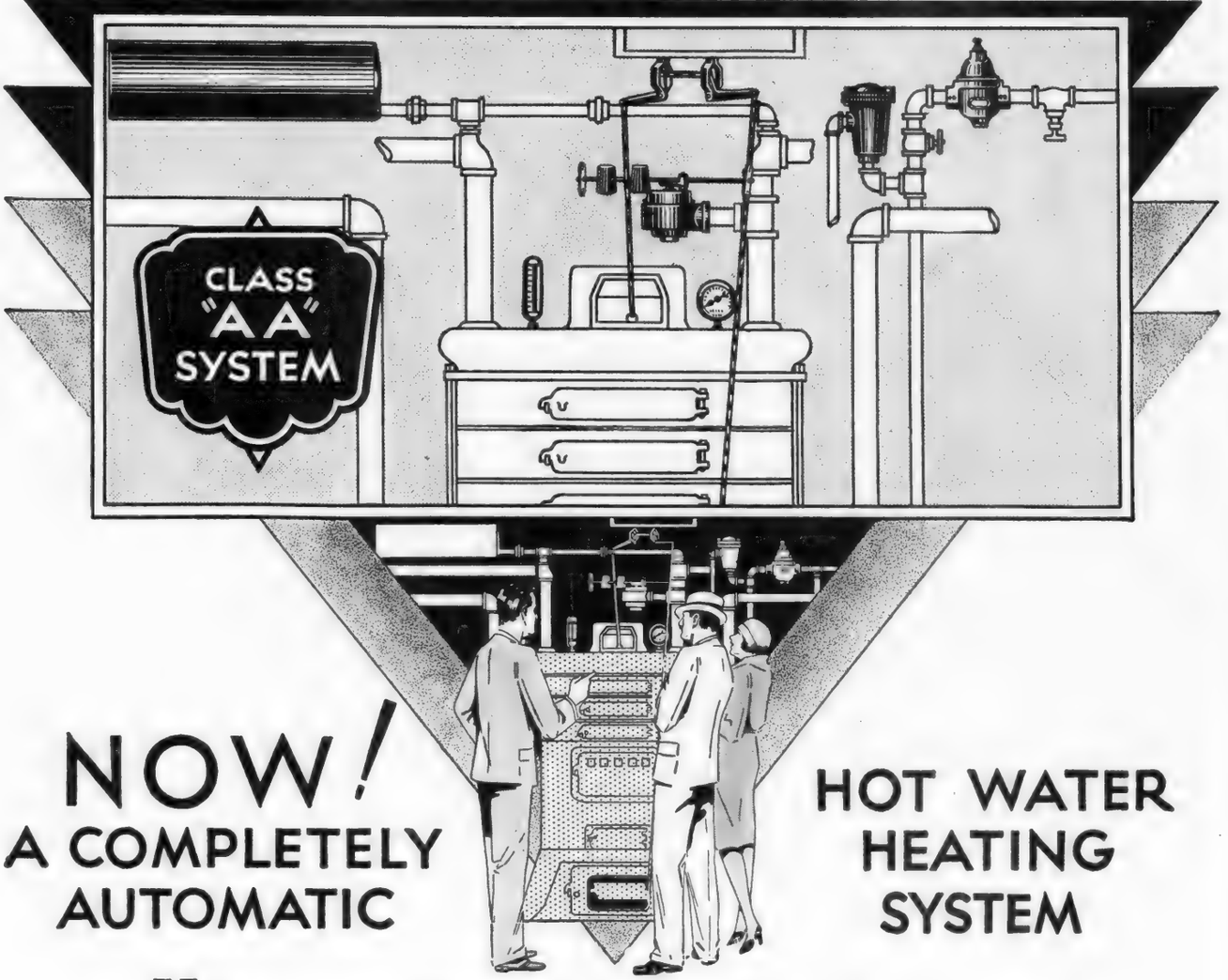
BISHOP & BABCOCK

TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

THE SUPREME ACHIEVEMENT IN HEATING



NOW! A COMPLETELY AUTOMATIC HOT WATER HEATING SYSTEM

HERE is *the finest equipment possible* for a hot water heating plant. Anyone can sell the cheapest, but the man who sells the very best is the man who *builds a reputation* in the heating business.

Thrush Class AA Equipment is *the ultimate achievement in automatic control* for Hot Water Heating systems. It not only provides *automatic* damper temperature regulation, it not only makes a *closed system* operating under increased pressure from any gravity job, with safe *automatic* pressure relief, but it also provides *automatic filling*. The Thrush Pressure Reducing Valve *keeps the system filled with water* at all times.

Long after the cost is forgotten, the heating plant is either giving satisfaction or it isn't. To build a firm, unshakable reputation for dependable heating, *install Thrush Class AA Equipment. Use the coupon now* to get more information about it. Also ask about the Thrush Electric Water Circulator.

H. A. THRUSH & CO.,
Dept. A., Peru, Ind.

Tell me more about Thrush Class AA System of Hot Water Heating and give me the names of jobbers in my locality who can supply it.

Name .....

Address .....

H. A THRUSH & CO., *Peru, Ind.*

THRUSH SYSTEM
OF HOT WATER HEATING

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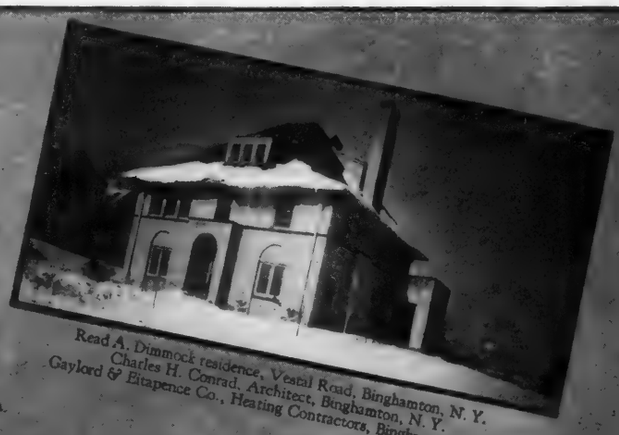
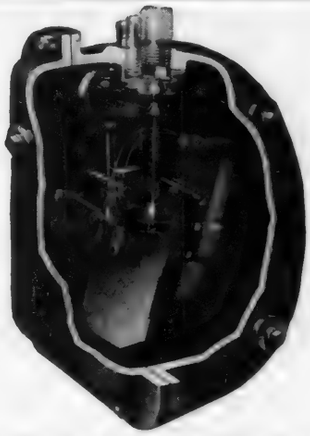
Robert Frost Daggett, Architect, Indianapolis, Indiana
W. H. Johnson & Son Company, Heating Contractors, Indianapolis, Indiana.



Read A. Dimmock residence, Vestal Road, Binghamton, N. Y.
Charles H. Conrad, Architect, Binghamton, N. Y.
Gaylord & Eitapence Co., Heating Contractors, Binghamton, N. Y.

Marshall J. England residence, Ledgewood Road, Winchester, Mass.
Allen E. Boone, Architect, Winchester, Mass.
Ingalls & Kendricken, Inc., Heating Contractors, 14 Chardon St., Boston, Mass.



WEBSTER BOILER RETURN TRAP

Made in five sizes for jobs up to 16,000 sq. ft. Easily installed. Interior mechanism suspended by two cap screws on outside of casing at top. Float mechanism turns about monel metal shaft. Float has no exposed seams. Provision for silencing includes stainless steel cantilever leaf spring in smaller sizes and dash pot in larger sizes. All metal valves with loose connections prevent jamming and leakage. Dirt strainer on steam line from boiler protects the mechanism.

When you're bidding on jobs like these—

HEATING CONTRACTORS who are doing *preferred business* make a special effort to get Webster Type "R" Systems of Steam Heating into the finer types of residences and other buildings.

Experience has convinced them that the Webster Type "R" System, because of safety, economy and downright satisfaction of owners, writes a fine testimonial for future business. The safe and sound principle of gravity operation with positive equalization of pressure *plus* the dependable performance of Webster equipment make the Type "R" System unusually free from trouble and complaints.

Before preparing your next bid get in touch with the nearest Webster Branch Office. You will find a practical heating man who will assist you in developing this *preferred* business.

- since 1888

Webster

Systems of Steam Heating

More than 51,000 installations in America's finer buildings

WARREN WEBSTER & COMPANY, Camden, New Jersey. a. R9

Please mail Bulletin B-600, describing the Webster Type "R" System of Steam Heating to

Name..... Street..... City.....

Celotex insulation provides easy control of temperature for enclosures where high temperatures must be maintained ... insures high operating efficiency.

Ovens, driers, tentering machine enclosures, *Insulated* with Celotex Industrial Insulation Board

. . the low thermal conductivity of Celotex insures high operating efficiency

WHEN certain rooms or enclosures must be kept at higher temperatures than the rest of the plant, Celotex Industrial Insulation Board solves the problem of temperature control.

In the textile industry, tentering machines require a higher room temperature than other processes. Many manufacturers have accepted Celotex as the standard material for insulating the enclosures.

In ovens and driers, where it does not come in direct contact with temperatures greater than 200° F., Celotex provides the insulation necessary to high operating efficiency.

The thermal conductivity of Celotex Industrial Insulation Board is remarkably low . . . 0.33 B.t.u. per hour, per square foot, per degree Fahrenheit, per inch of thickness.

And the ease with which it is handled and applied *cuts labor costs.*

The boards measure 3′ by 6′, with a thickness of approximately ½ inch or multiples thereof—and have a tensile strength of 150 lbs. or more per square inch.

Our engineers will gladly cooperate with you by furnishing specifications for any particular problem.

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Branch Sales Offices in many principal cities
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BRAND
INSULATING CANE BOARD
INDUSTRIAL INSULATION

The word CELOTEX (Reg. U. S. Pat. Off.) is the trademark of and indicates manufacture by The Celotex Company, Chicago, Ill.

PIPING

— a "VITAL SPOT" in your CONTRACT

It's mighty good assurance to know that "Etna" Welded Steel Pipe is going into your job—the pipe that is backed by the manufacturing skill that comes with over a century of specialization.

In fact when you specify "Etna" in your contract, it amounts to a guarantee that you are getting the very highest grade of welded steel pipe that modern machinery and modern methods can produce—a pipe backed by a world-wide reputation for service.

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General Offices: CLARK BUILDING, PITTSBURGH, PA.

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Welded Mills: Etna, Pa. Sharpsburg, Pa. *Seamless Mills:* Ambridge, Pa.

ETNA WELDED STEEL PIPE

Why the SHIP LAP EDGE of INSULITE Roof Insulation is an *Important Feature!*

AN Insulite Roof Insulation Job means that the roof is heat-sealed all over with no un-insulated spaces between slabs . . . It means reduced maintenance and repair costs for the building owner. For should one slab or unit become damaged it can be easily, quickly and economically replaced.

Insulite Roof Insulation is applied as with any other insulation board by mopping the roof deck with hot pitch or asphalt. In addition the shiplap edges of Insulite are also mopped. This makes a perfect bond between each slab, or unit of Insulite.

With Insulite, in case of damage to one unit, moisture cannot seep from that section into adjoining units. The shiplap edges bonded together with pitch or asphalt prevent any such possibility.

Another feature to remember about Insulite Roof Insulation is that it can be had in bundles wrapped at the factory—insuring that there will be no battered or broken edges.

And remember, Insulite Roof Insulation is a full inch thick—this means 12½% more efficient insulation than ordinary ⅞-inch roof insulation boards.

Our book, "Roof Insulation and the Prevention of Condensation," is full of important facts about roof insulation. It shows how coal and radiation requirements are reduced when roofs are insulated with Insulite, and it describes the methods of applying Insulite in order to secure the most satisfactory results. Your free copy will be sent upon request. Ask for A. I. A. File 37a1.

THE INSULITE COMPANY 1204 BUILDERS EXCHANGE Dept. 11 **MINNEAPOLIS, MINN.**

INSULITE

the Wood-Fiber Insulating Board

Fig. 856, Jenkins Low Bonnet Lock Shield Globe Radiator Valve, male union, and Fig. 857, Jenkins Low Bonnet Lock Shield Angle Radiator Valve, male union. To prevent tampering, both valves are operated by Fig. 171, Jenkins Tee Handle Key.

Trust Jenkins to keep trust

When you entrust the valve duties of a new installation to Jenkins Valves, you can trust Jenkins to keep trust. You can count on them to uphold their reputation for long-term service.

This characteristic trouble-free performance of Jenkins Valves reacts definitely to the contractor's advantage. It frees him from the unprofitable job of "servicing" completed installations. Instead, it enables him to keep his men always on new work.

There is a Jenkins in bronze or iron, in standard, medium or extra heavy pattern for practically every heating requirement. At your supply house.

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JENKINS BROS., Limited, Montreal, Canada; London, England
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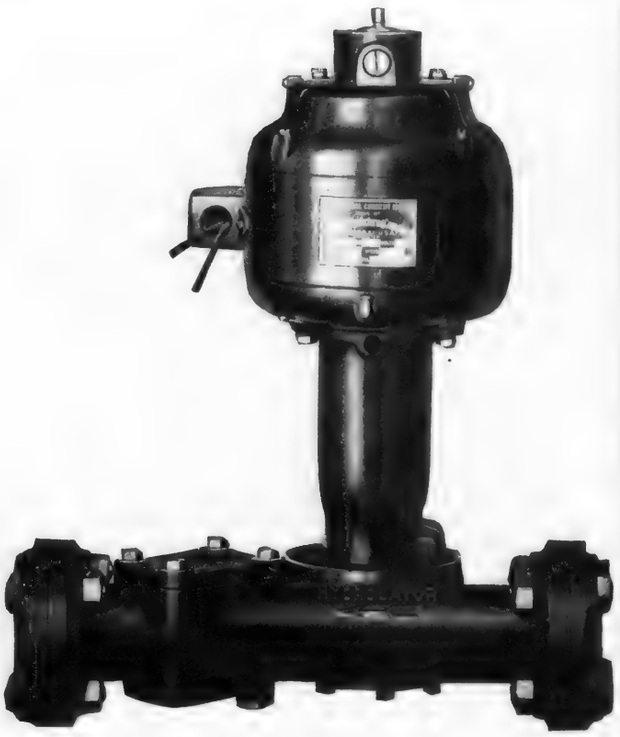
Jenkins
VALVES
Since 1864



There is Only One HYDROLATOR

The HYDROLATOR is available in 1½, 2 and 3-inch sizes suitable for installation on systems with two 1½, 2 or 3-inch return lines respectively.

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Gentlemen: Please send me, without obligation, my copy of Bulletin 529-H.

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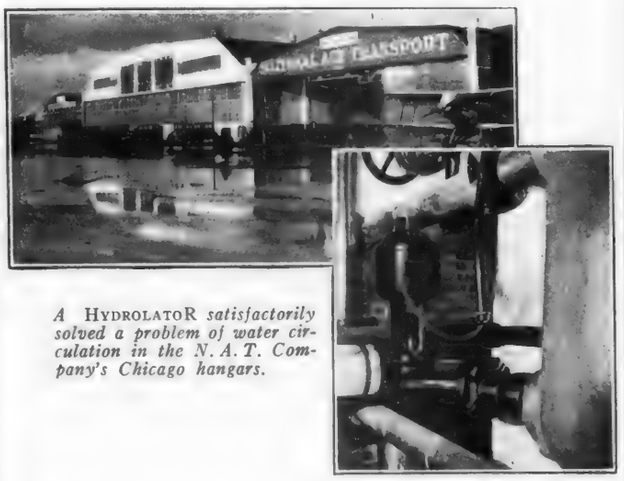

A HYDROLATOR *satisfactorily solved a problem of water circulation in the N. A. T. Company's Chicago hangars.*

Are YOU Getting Your Share of This Summer's HYDROLATOR Business?

Every "sick" hot water job as well as every new hot water system now being installed is a logical prospect for a HYDROLATOR. Thousands will be installed this summer. Are you getting your share of this business?

Easy to Sell

You have two of the strongest sales arguments in the world on your side when selling a HYDROLATOR—greater heating comfort and greater fuel economy.

Easy to Install

Any heating contractor can install a HYDROLATOR—and there's a good profit to be made on the installation work.

Liberal Discounts

Every HYDROLATOR installation means a decided boost in your profits column. Discounts are generous. Why not concentrate on getting more of this business. We'll furnish all the literature you need.

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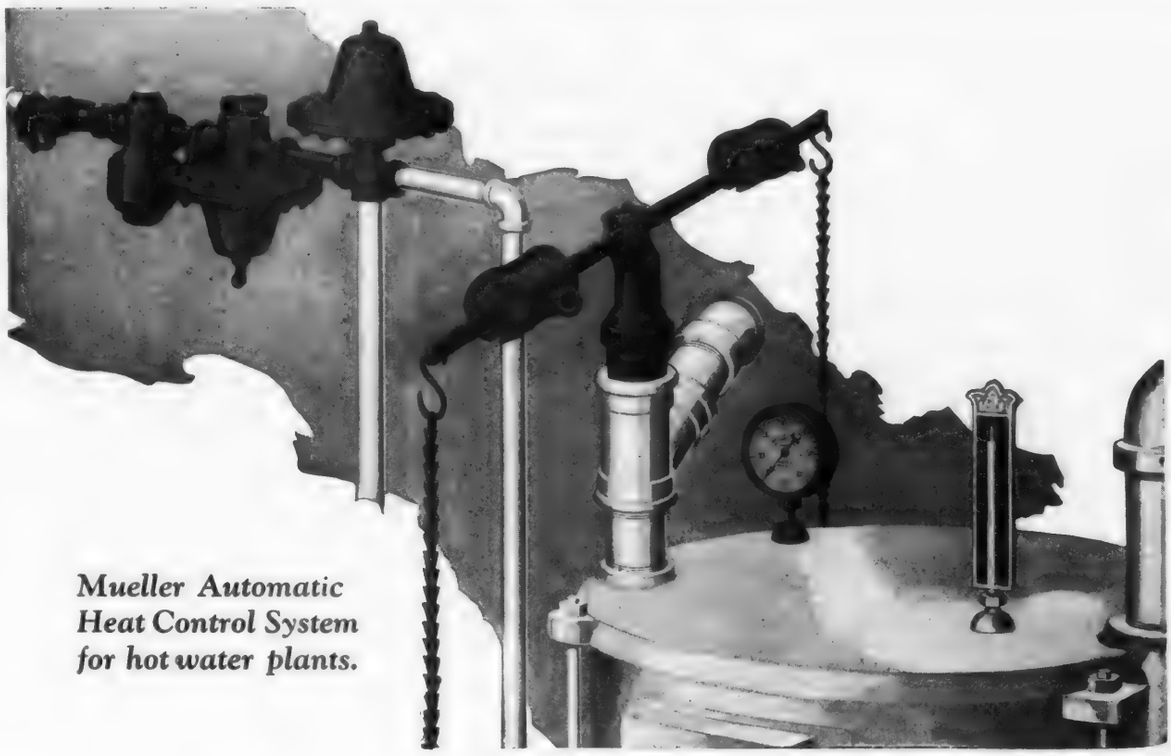

Mueller Automatic Heat Control System for hot water plants.

Year-round profits!

in Mueller Automatic Heat Control for Hot Water Systems

You don't need to wait for new building construction to make money on the Mueller Automatic Heat Control System. Every hot water heating plant with an expansion tank in your territory is a live prospect for a replacement.

It's easy to sell because it saves owners both time and fuel. It automatically controls the supply of water and regulates the dampers. The more efficient operation of the plant gets more heat out of the system and saves coal.

Old heating plants can be quickly modernized and new plants are not up to the minute without the Mueller Automatic Heat Control. Every installation is a booster for more business. It takes less time and labor to put in than an expansion tank and gives a generous margin of profit on both old and new jobs. Write for complete information.

MUELLER CO. (Established 1857), Decatur, Illinois; *Branches:* New York, Dallas, San Francisco, Los Angeles; *Canadian Factory:* MUELLER, Limited, Sarnia.

MUELLER

Automatic Heat Control System

MARSH RE-ENFORCED PACKLESS, CONE DISC LINE, complete in ALL PATTERNS and SIZES; *Angles, Globes, Corner* and *Back Offsets,* both PACKLESS and MODULATED types.

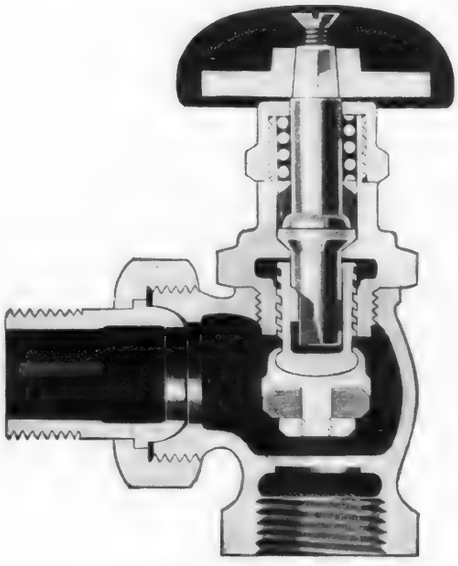

Fig. 141—Sectional View

Fig. 141

In addition to the above CONE DISC LINE, our FLAT DISC LINE is ALSO COMPLETE IN ALL PATTERNS and SIZES, BOTH PACKLESS and MODULATED.

FURTHER: We furnish complete line of GLAND PACKED, rising stem valves, *Angles, Globes, Corner* and *Back Offsets,* all Sizes, BOTH in CONE and FLAT DISC Patterns. Also, ***quick opening*** and ***upper seat*** GATE Valves, ***both with screwed ends*** and ***with unions, all sizes.*** Line complete. Get our Catalog and Discount Sheet.

WE SPECIALIZE on HIGH GRADE radiator valves, THEREFORE QUALITY; and manufacture and furnish the largest and most complete line of any company in the world, THEREFORE QUANTITY at minimum cost; and—QUALITY and COST—are two important factors to consider in placing orders.

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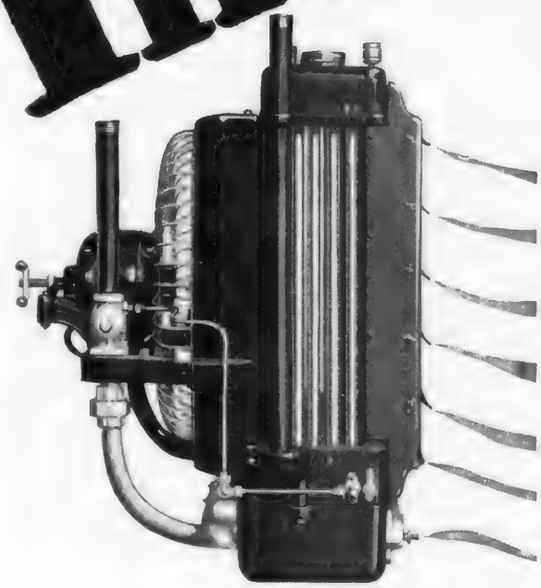
Industrial Heat



in its most efficient, flexible and economical form!

SELF-CONTAINED gas burning units that deliver heat in just the right spot, just what is necessary—and no more; just when needed—and no longer! No expensive boilers and steam lines required; no licensed firemen. Instead—automatic, individually controlled heat . . . instant heat, without waste, at the turn of a valve. Such is the economy, flexibility and efficiency of Humphrey Industrial Unit Heaters. And they are easy and surprisingly inexpensive to install. Put them anywhere, suspended at any distance from the ceiling. Thermostatic control makes them ideal for kilns, as well as for open factory space. Let us send our new catalogue, describing and illustrating this modern method of industrial heating.

The Humphrey
Industrial Unit Heater

GENERAL GAS LIGHT COMPANY, KALAMAZOO, MICHIGAN

New York, 44 W. Broadway San Francisco, 135 Bluxome St.

You take no chances when you select Trane Bellows Traps and Valves

Trane heating specialties embody not only the most advanced engineering principles, highest quality of materials and workmanship — but also they are as nearly flawless as it is possible to make them. Trane Bellows Traps and Valves are subjected to four different critical tests which reveal any defects that might escape the most careful supervision during manufacture. They are tested with steam — tested by the Bureau of Standards method under actual operating conditions — tested for mechanical breakdown — and the bellows are tested for tension. All chance of error is eliminated.

The distinctive features of Trane Bellows Packless Valves reflect engineering research which has led not only to a mechanically efficient device, but one which meets the most exacting needs of a high grade heating installation. The non-rising stem, tension arrangement to hold valve in set position regardless of vibration, interchangeable wheel or lever handle, beautiful appearance and, of course, the fundamental Packless principle — no steam in contact with the valve stem at any point — place Trane Packless Bellows Valves far ahead of the field.

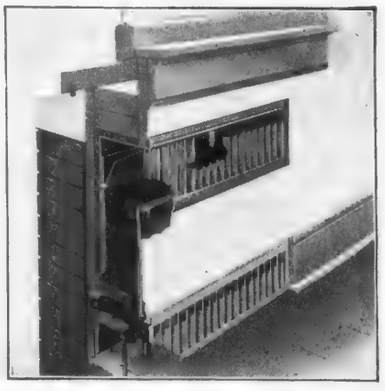
Trane Bellows Packless Valve

The Trane Bellows Trap

Trane Concealed Heaters

Like all other Trane Products, the Concealed Heater is in a class by itself. Closer inspection reveals a scientifically engineered job. The patented heating element gives a maximum heating effect for a unit of weight. The adjustable steel stack accommodates installations of various heights enabling standardization of complete units. The installation is entirely concealed except for the grilles which cover the air outlets and intakes. The scientific distribution of heat provides greater heating economy and more comfort — besides there is nothing to mar the harmony of an interior.

We will gladly send you our new catalog and any specific information at your request.



Sectional view of complete Trane Concealed Heater installation

HEAT CABINETS **TRANE** CONCEALED HEATERS

PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

THE TRANE COMPANY, Dept. 7
206 Cameron Ave., La Crosse, Wis.

Send free booklet on new style in heating.

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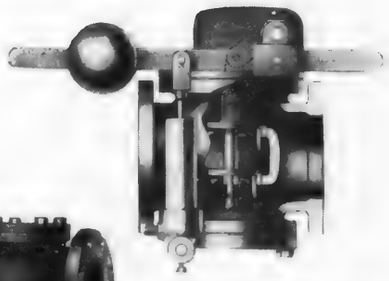

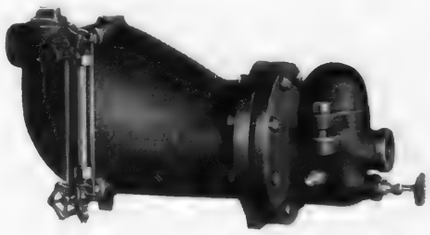

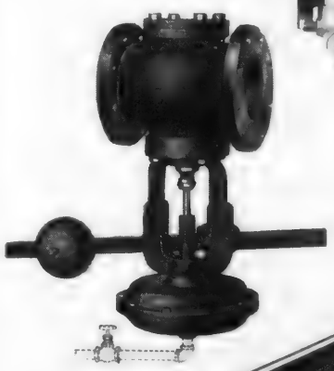

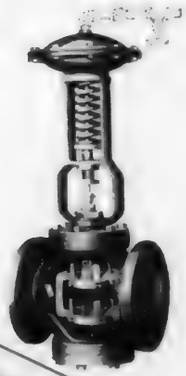

There's a McALEAR Specialty for Every Duty

Up to the minute—not only in completeness but also in design, engineering and construction — McAlear's Automatic and Mechanical Pressure and Liquid Controls are the logical, efficient units for ALL your specialty requirements.

We have a hobby — and that's our engineering and designing departments. They've been studying your needs, new installations and new systems for 25 years and they've kept McAlear abreast or ahead of these many improvements—an outstanding line of modern products, capable of serving your every need with equipment that efficiently controls and works with your most modern installations.

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Gentlemen: Yes, I want your book —please also give me definite information on.....
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You should have our new 128-page booklet with its many pages of typical installations, charts, diagrams. It is a text book for men faced with automatic control problems. The coupon brings your copy. Send it.

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ILLINOIS HEATING SYSTEMS

ILLINOIS
Zone Heat Control

An ILLINOIS two pipe automatic vacuum system, comprising 651 direct radiators and 10 unit-heaters, provides for the heating requirements in this modern 13 story structure. Two 10 inch risers run to the seventh floor; one supplies radiators from the eighth to the thirteenth floors, upfeed, the other from the second to the seventh floors with downfeed. In addition to modulating valves and thermo traps on radiators and drips, 38 blast traps drain the unit-heaters, large risers, and mains.

Five ILLINOIS Zone Control Valves (Hornung Patents), one 6 inch, and four 8 inch, type T, operated by five Mercoid, two circuit thermostats, regulate the temperatures for sections of the building, as follows: The office section from the second to the thirteenth floors, which is in the front end of the building, is controlled by one 6 inch valve. The remainder of the space on these floors is loft space and is controlled by four 8 inch valves. The positive temperature control effected by these valves avoids overheating and results in a marked fuel economy.

Write for the following bulletins

Bulletin 60—
ILLINOIS Zone Control Valves

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Boston Representative: **C. W. SISSON, 65 Franklin St.**

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ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD President INCORPORATED 1900

CHICAGO

Making ALL types, Skinner Brothers are

never restricted in picking the type of unit heater that *exactly* fits your building

NO *one* type of unit heater can be *exactly* suited to *every* kind of open-space building. That is why the Skinner line of unit heaters includes *all* types—floor type or suspended, steam or direct-fired, prime or extended-surface coils. And that is why Skinner engineers can always pick the type of heater best suited to *your* building, no matter what heating problem it presents.

Unit method accepted as best way to heat open-space buildings

The Skinner Brothers Method does not merely bring heat into the room and then let it float up into the unused space overhead. Fans in the units hold the heated air down where the workers need it and, by constant recirculation, diffuse warmth evenly over the entire room.

Greater length and variety of experience than anyone else

Since Skinner engineers originated the Unit Method of Heating, more than 34 years ago, they have adapted it to thousands of buildings. They have studied and successfully solved every imaginable kind of heating problem in buildings of every structural type.

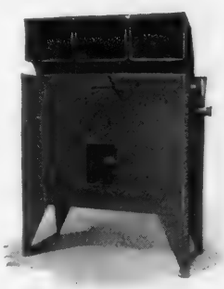
Recognizing these facts, you know *why you cannot afford to plan heating without calling in a Skinner Man.*

There is a Skinner Air Heater to fit the heating needs of every type of open-space building

Skinner Bros. "Baetz Patent" Air Heater

Skinner Bros. Patented Direct-Fired Air Heater

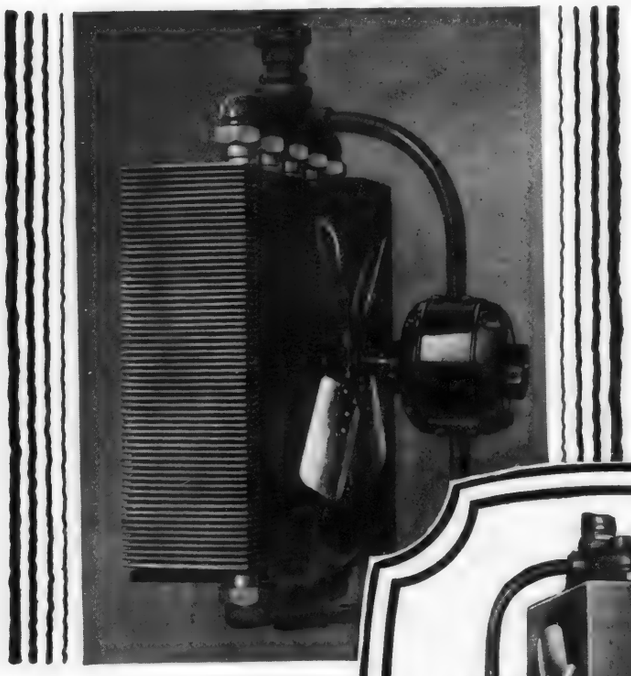
Skinner Bros. Patented "Lightweight" Air Heater



Skinner Bros. Type "U" Air Heater

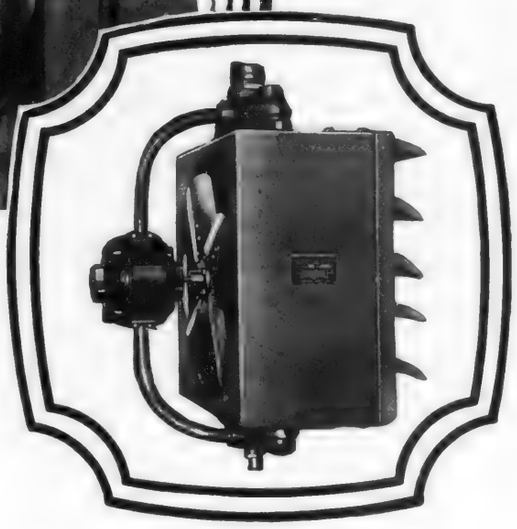
Skinner Bros. Air Heaters

SKINNER BROTHERS MANUFACTURING COMPANY, INC.
1470 S. VANDEVENTER AVENUE, ST. LOUIS, MO.
BRANCHES IN ALL PRINCIPAL CITIES



Bigger than its job

To make sure that every Thermal Unit will prove bigger than its job, the heating section of each heater undergoes a test of 400 pounds.



Efficiency that doesn't wane

In laboratory tests, the Thermal Unit is not surpassed by any other Unit Heater—but never lose sight of the fact that a laboratory test deals only in maximum efficiency made under *ideal* conditions.

It is in the greater and more exacting laboratory of daily use that the added stamina of the Thermal Unit *counts*. Instead of the efficiency curve drooping and doing a slow "fade out," it stays on the high flat plane.

Behind this sustained efficiency is the durable one-piece heating element—the basic betterment of the Thermal Unit. Cast in a specially formulated aluminum alloy, this sturdy unit will withstand higher pressures than any piping system. There are no joints, welds or soldered connections—no points at which leaks can develop. Even freezing in service cannot damage it.

In this way, the weak point of ordinary construction has been made the strong point of the Thermal Unit. Let us show you what this balanced design means from a practical standpoint. Write.

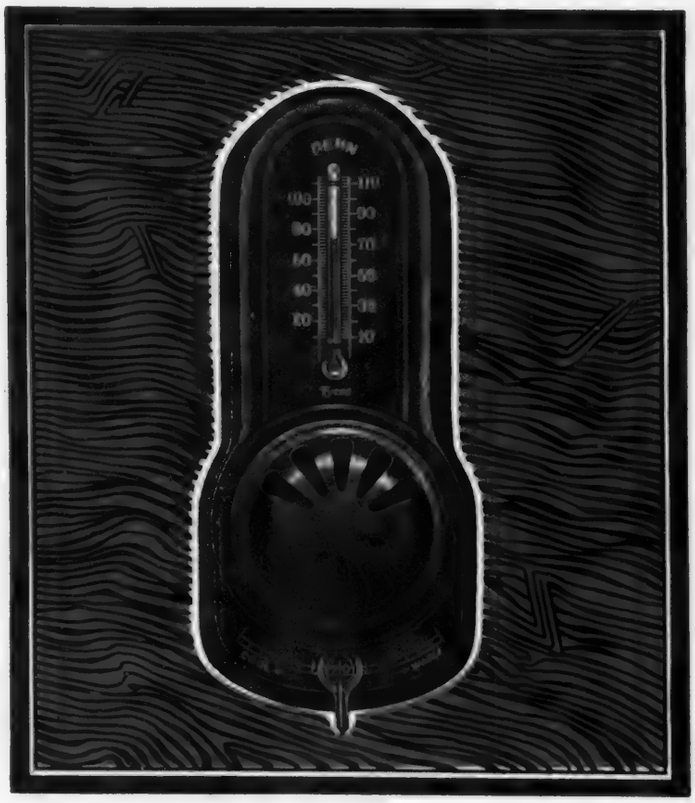
THERMAL UNITS CO.
A subsidiary of the Mechanical Mfg. Co.
Pershing Road and Loomis St., Chicago
Eastern Office: 30 Church St., New York, N. Y.

Approved by the Investigating Committees of Architects and Engineers

THERMAL UNIT
INTEGRAL SECTION
HEATERS
PATENT PENDING

It outlasts them all

..and Now.... a better Thermostat for Oil Burners



YOU'LL welcome this better controlling device for oil burners and unit heaters, both for its simplicity and its unusual sensitiveness. The new Penn Thermostat, embodying the exclusive Penn Magnet Contacts, eliminates fragile tubes and complicated hook-ups. With its supreme sensitiveness and constant accuracy (two degrees differential) and harmonious appointment, I offer you greater sales opportunities and save time and money in installation and servicing. Supplied complete, ready for installation. Priced comparable with other standard makes, and backed by an unconditional guarantee. We invite you to test it at our expense.

Manufactured by an organization of proven engineering genius that supplies the largest and best concerns of the country with automatic control switches

PENN ELECTRIC SWITCH CO.

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A Complete Line of Automatic Electric Switches for
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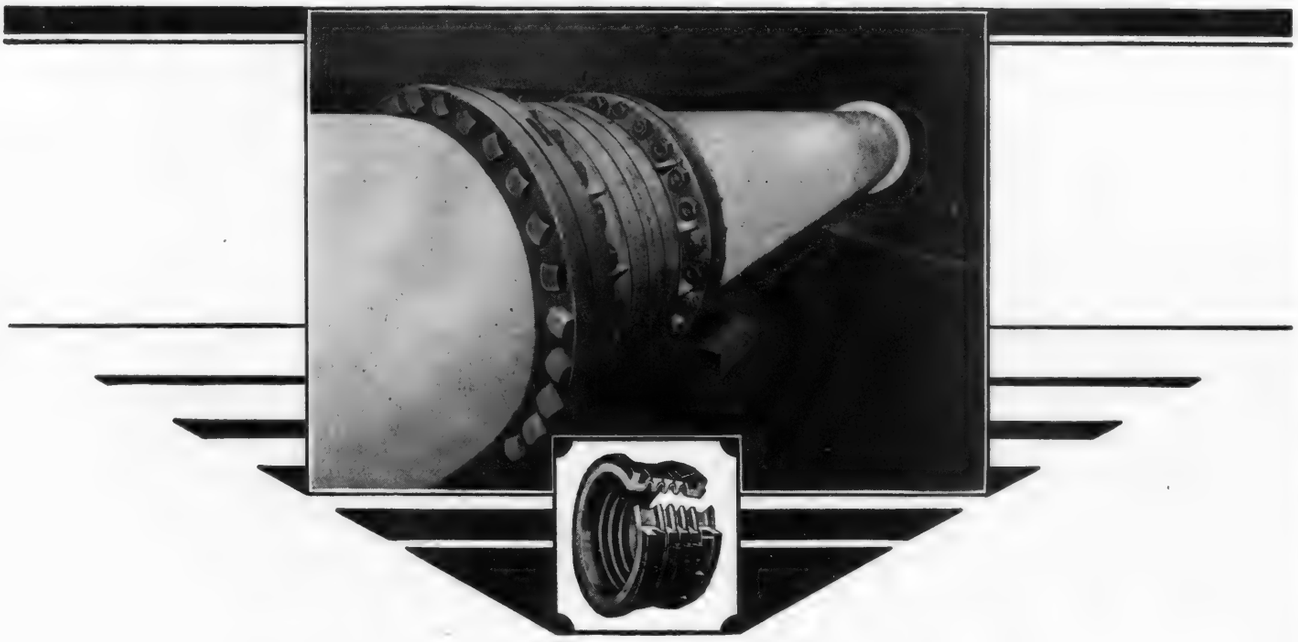

This "Pack-less" Joint Means Uninterrupted Service

Badger Joints require no packing.

This "pack-less" feature of Badger Self-Equalizing Joint appeals to steam distributing companies in particular. They are under contract to deliver steam without interruption.

As one prominent company put it:

"The only character of joint suitable for use in New York City is one that shall never require repacking and which for our purpose is a most vital matter as continuity of service throughout the year is essential."

This company uses several thousand Badger Self-Equalizing Expansion Joints.

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BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E. B. BADGER & SONS COMPANY · TRADE MARK

"THEY KEEP O A-RUNNING"

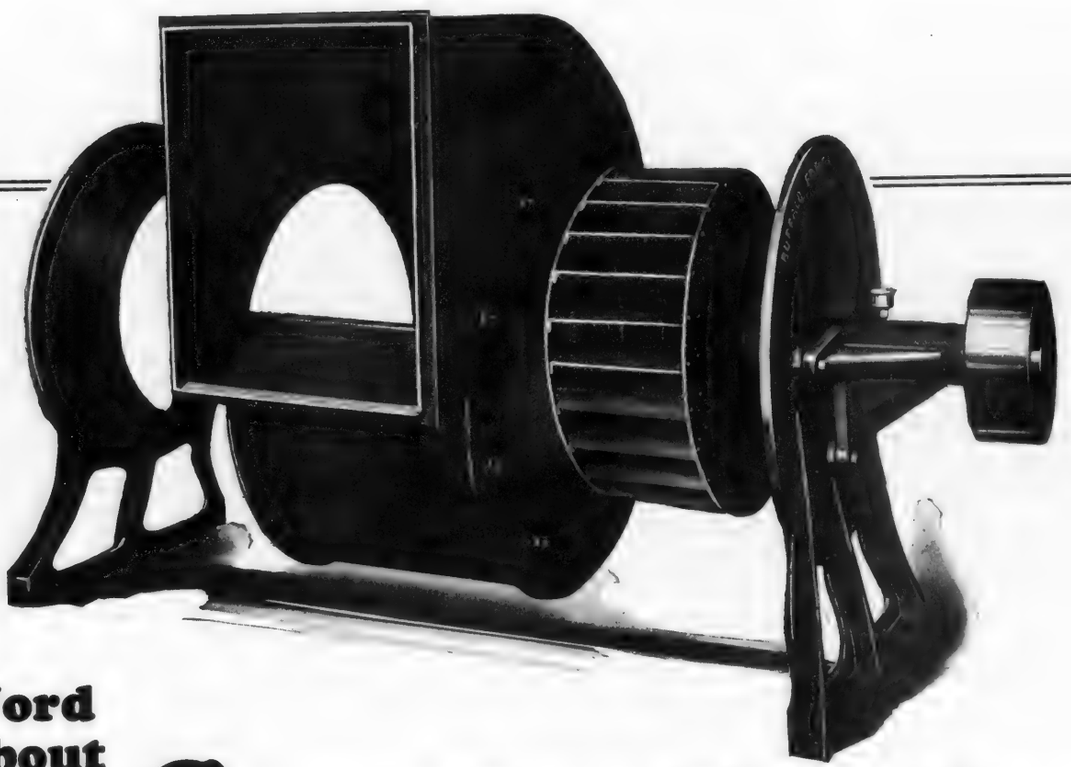
250 Horse Power

Century 60 Cycle 440 Volt 1800 R. P. M.
3-Phase Squirrel Cage Induction Motor

These general-purpose motors are built liberally and with large ventilation passages to insure continuous operation at high speeds and also—in slower speeds—under the adverse conditions frequently encountered in the broad range of general-purpose open-rated motor applications.

Century 3 and 2 Phase Squirrel Cage Induction Motors are built in standard sizes and speeds from ¼ to 250 horse power. Temperature rating, 40° C.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.
40 U. S. and Canadian Stock Points and more than 75 outside thereof



A Word About

Standardization

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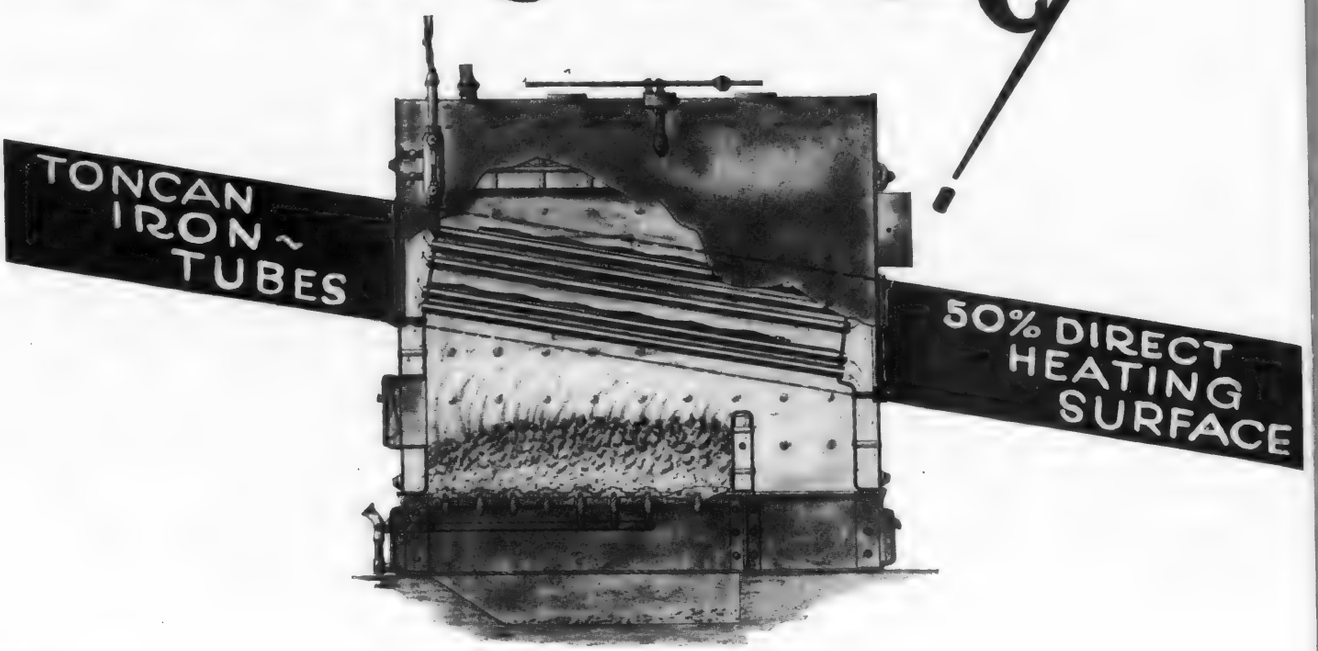

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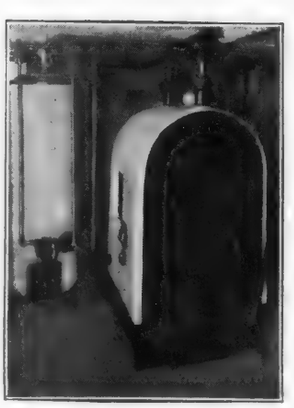

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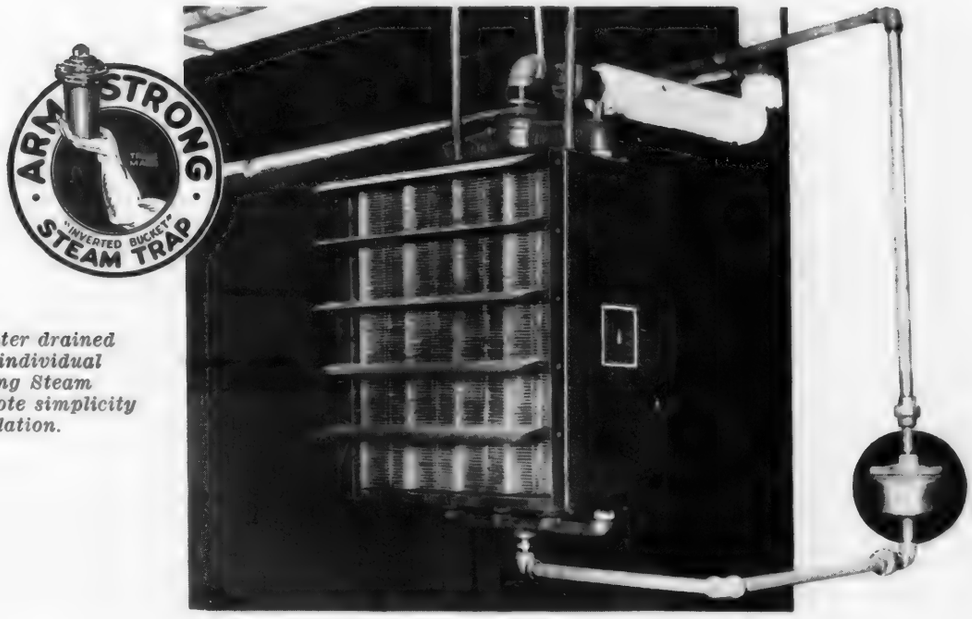

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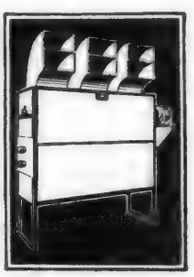

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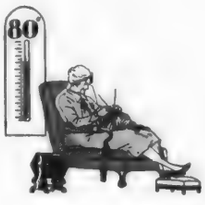

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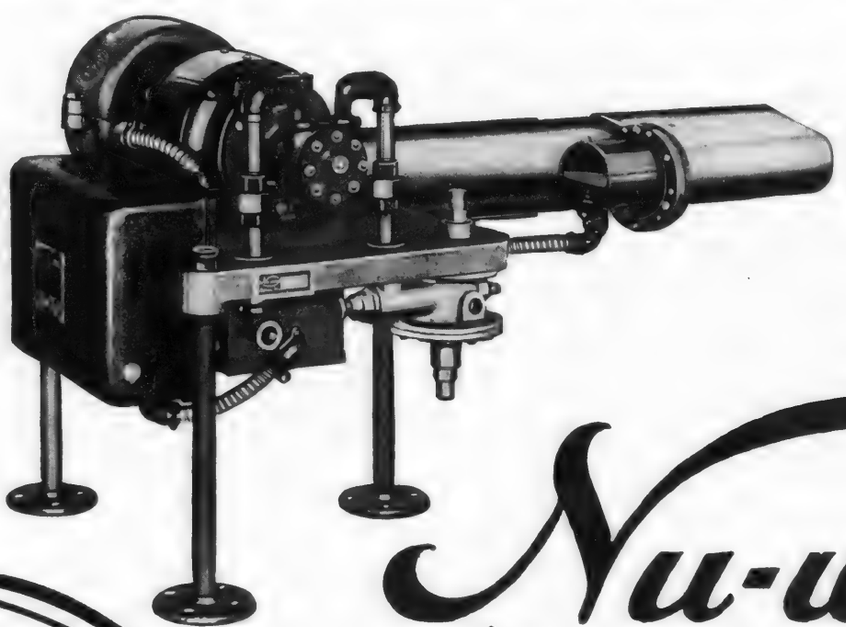

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HEATING AND VENTILATING

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The June Issue "Goes Over"

IT would manifestly be impossible to reproduce the many letters which have come to us in appreciation of our June Silver Anniversary Number. Typical of them all is the following which explains why we are so deeply gratified at the reception accorded the Silver Anniversary issue:

"The writer wants to tell you how pleased he was with the new HEATING AND VENTILATING and particularly your Silver Anniversary Number. Without any doubt you are publishing one of the finest technical magazines in the world and it should give you great satisfaction to know that your readers and advertisers are so well pleased with your publication.

"I also believe that you can look forward to the next twenty-five years with complete confidence because the heating and ventilating industries undoubtedly are on the threshold of immense progress.—*Charles A. Carpenter, Carpenter & Byrne, Erie, Pa.*"

A. S. Armagnac

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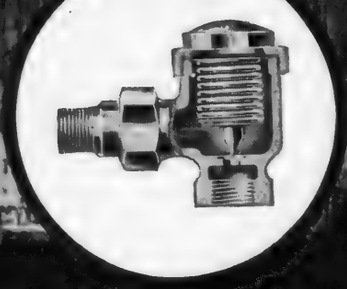

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A GOOD Heating System

HEATING AND VENTILATING

Editorial

ON the whole, events have moved rather swiftly in the boiler-rating movement since the annual meeting of the American Society of Heating and Ventilating Engineers in Chicago last January. At that time, it will be remembered, the society adopted some revisions to its code for testing low-pressure heating boilers and, in addition, took the bull by the horns by adopting a boiler-rating code, notwithstanding the objections voiced by representatives of the boiler manufacturers. Subsequent events, as related at the recent semi-annual meeting of the A.S.H. & V.E. last month, are more than interesting. No sooner had the rating code been promulgated than attempts to apply it to the performance data of typical boilers showed its unworkability for all conditions. At the same time, the fact that the cast-iron boiler manufacturers, but a short time before the society's January meeting, had adopted a testing code of their own further complicated matters.

At this critical juncture the society's Continuing Committee, which is the new name of the Committee on Interpretation of the Boiler Rating Code, under the chairmanship of L. A. Harding, took a step which changed the whole situation by adopting *in toto* the boiler-testing code of the cast-iron boiler manufacturers' association, under the title of the "A.S.H. & V.E. Performance Test Code for Steam Heating Solid Fuel Boilers." Not only that, but the committee went even further by drafting a revision of the January, 1929, "A.S.H. & V.E. Code for Rating Steam Heating Solid Fuel Boilers," doing away with the limiting flue-gas temperature item which was one of the principal bones of contention in the previous code.

While the new draft is acceptable to the National and Boiler and Radiator Manufacturers' Association, a fresh complication has arisen in the form of objections from the steel boiler manufacturers. For one thing, the steel boiler people feel that the selection of boilers based on maximum capacity figures would result in the selection of smaller sizes than now are used, with consequent lowering of operating efficiency, as far as steel boilers are concerned. The fact that the proposed new code does not consider heating surface is another point on which the steel boiler people find themselves in disagreement with the society's committee. In addition, they feel that a multi-rating, as specified in the proposed code, would tend to cause confusion.

As an alternative, the steel boiler manufacturers have gone on record as recommending that published boiler ratings correspond to the "estimated design load as defined in Section 5 of the A.S.H. & V.E. Code of Minimum Requirements, and that the published boiler ratings be determined by the amount of heating surface and grate area."

These obstacles do not seem to be insurmountable and, with the understanding already reached with the cast-iron boiler manufacturers, hopes may well run high for an early agreement among all these interested parties on a boiler-rating code.

ONE of the best features of the situation is the fact that the work of the Heating and Piping Contractors National Association on the same subject, so far from having set up a separate standard, has served as a basis for an agreement on the part of those interested.

At the same time, a world of credit goes to the A.S.H. & V.E. Continuing Committee for its action in accepting the testing code of the cast-iron boiler manufacturers and thus paving the way for their cooperation, which has always been recognized as a vital factor in establishing a rating code.

IF the rating code, as now proposed, is adopted, manufacturers' catalogs in the future will contain at least five guaranteed boiler output ratings under specified conditions of operation and chimney dimensions. These ratings will run from the maximum boiler output to 35% of that maximum.

When it is considered how much thought has been given this subject during the years it has been under discussion and the reams of printed matter that have carried the many conflicting opinions, it is significant indeed that the whole matter of rating boilers may now be expressed in a page and a half of printed text.

SOME of the difficulties in the proper selection of building insulating materials were brought out in one of the papers presented at the midsummer meeting of the A.S.H. & V.E. Although no agreement could be reached, the animated discussion which followed the presentation emphasized the crying need felt by manufacturer and user alike for a more effective basis of comparison than has been evolved to date. In the scramble for business it is evident that too much attention has been devoted to hair-splitting differences in the conductivities of the materials themselves and not enough to various economic factors needed for an intelligent selection on the part of the user.

Recirculation as Applied to the Butler University Field House

by **JOHN M. ROBERTSON**

E. K. Campbell Heating Co., Kansas City, Mo.

Part I

TESTS on the recirculating heating and ventilating system in the Butler University Field House, Indianapolis, have demonstrated that rooms of large size may be heated evenly with a simple duct system provided certain fundamental rules are followed. A low temperature difference between floor and ceiling can be obtained with a consequent increase in comfort and fuel saving and a cold building may be heated quickly and economically. Furthermore, the efficiency test on the heaters developed for large buildings, and used in this installation, indicate the value of an unusually large secondary heating surface advantageously placed to utilize a large percentage of heat from the flue gases before they reach the chimney.

The main room of the Butler University Field House is 330 ft. long, 206 ft. wide, and 85 ft. high in the center, and has a seating capacity of 15,000. At one end are a swimming pool room and a gymnasium, and beneath one side of the entire building are locker, shower and toilet rooms.

Located at the center of the north side of the main field house, the

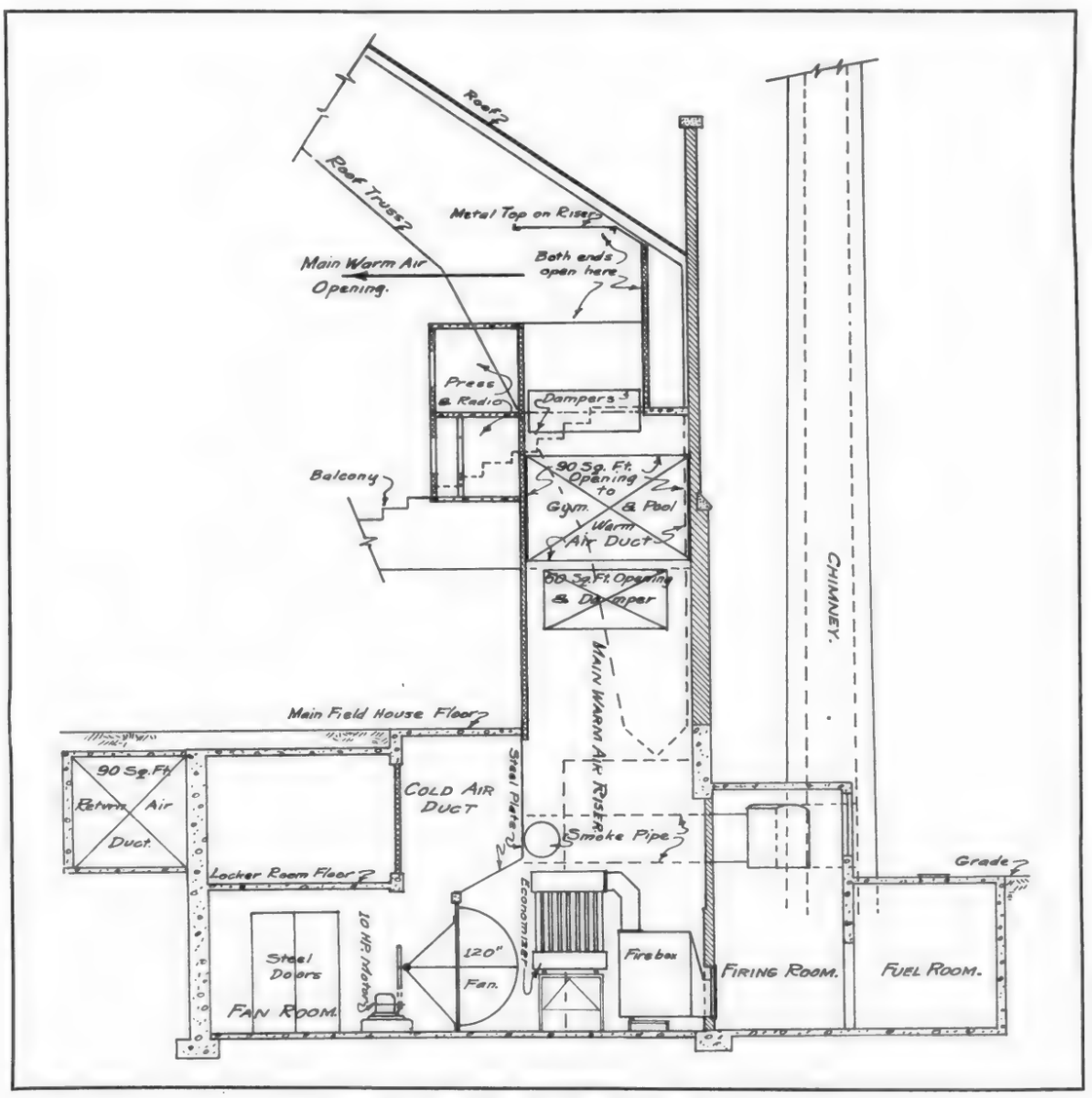


Fig. 1. Cross Section through Heater

Butler University
Field House

heater room is situated in a sub-basement. The field house proper, gymnasium, swimming pool and locker rooms are heated with a furnace fan system, while toilets and three small vestibules are heated with direct steam radiation and unit heaters.

Air is drawn from the floor of each of the large rooms at one point and carried to the basement where the air is warmed and moistened, then delivered back to the rooms through a single opening. The space beneath the balcony in the field house proper is treated as a separate room and air is discharged beneath it from the main riser, to insure a circulation of air in this space. No other distributing ducts or units of any kind are employed for distribution. The warm-air openings are kept high enough so that the distribution of the warm air will be above the heads of occupants, and the cold air openings are made of such size that the air velocity is low and almost imperceptible.

Three furnaces, of a type developed to meet the exacting requirements of large buildings heated intermittently, heat the air. The first requirement is ruggedness of construc-

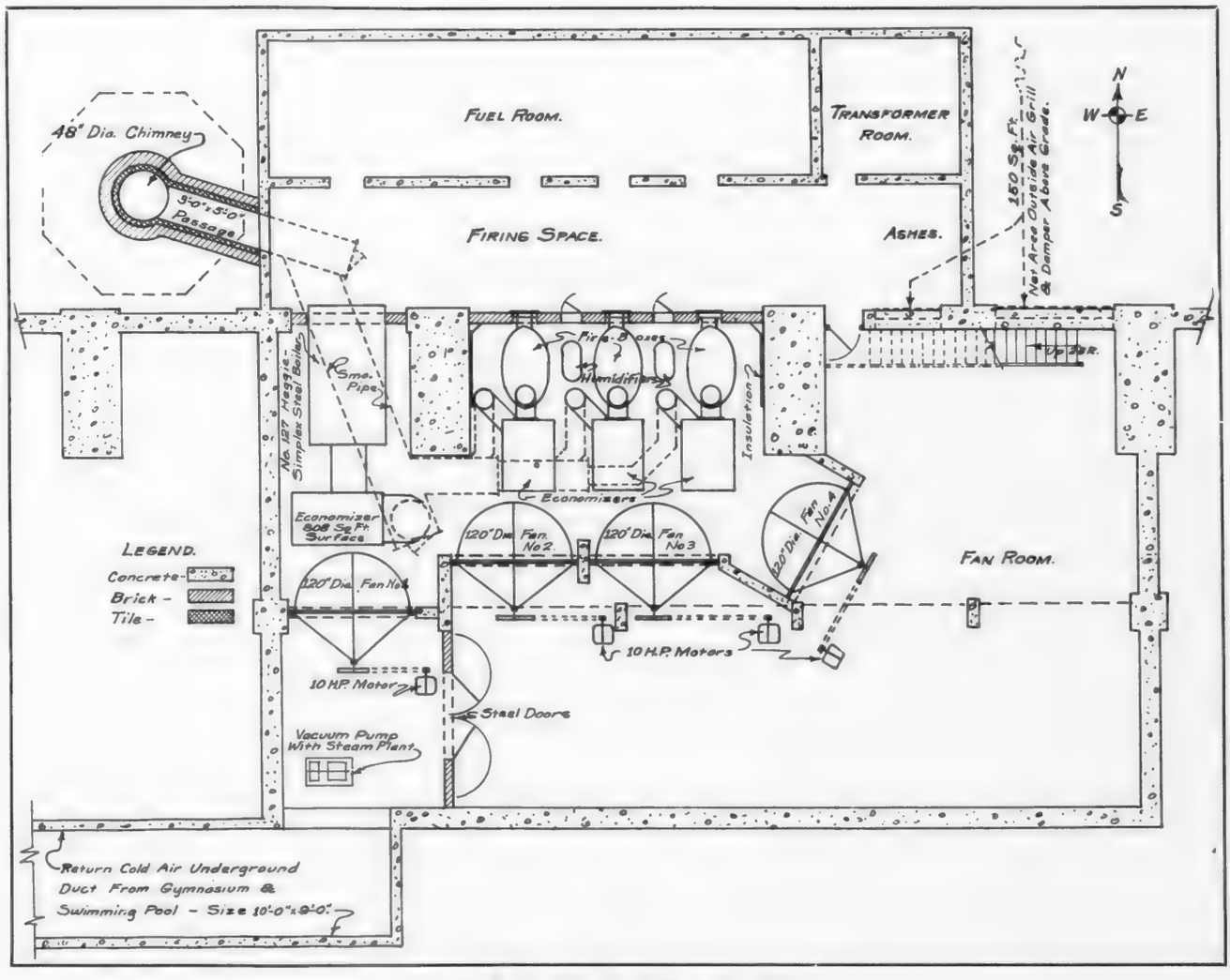


Fig. 2. Floor Plan of Heater Room

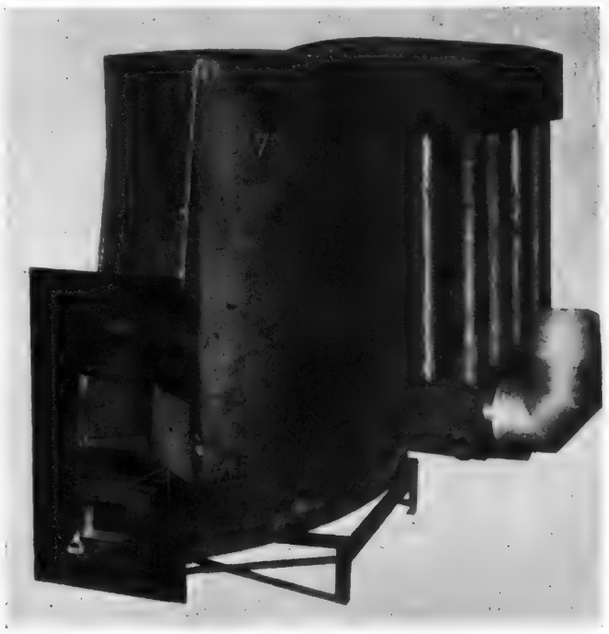


Fig. 3. Heavy Duty Heater Installed in Field House

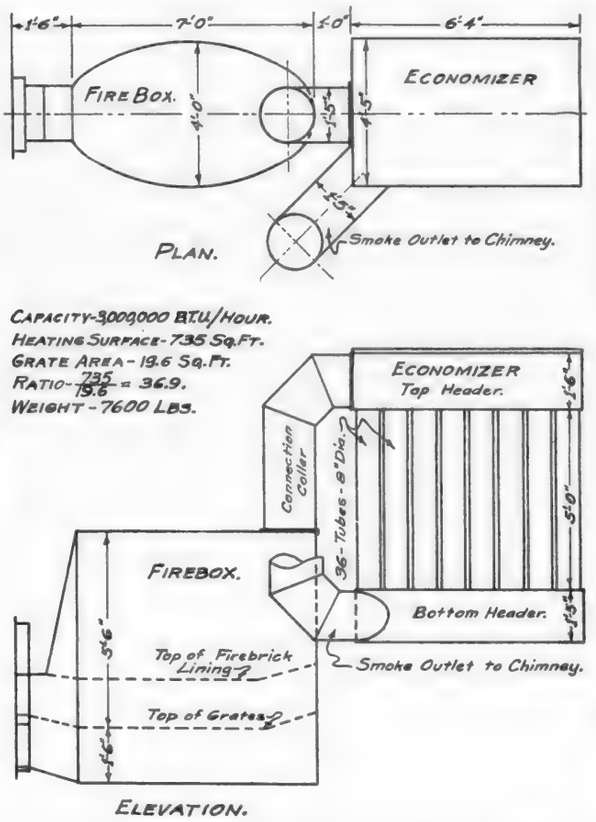


Fig. 4. (Right) Detail of Heavy Duty Heater

tion to withstand heavy firing and abuse by janitors. The extremely heavy firing to heat a cold building up quickly, in turn, necessitates a greater area of secondary heating surface than is usual in warm-air furnace construction. The firebox of each heater is built of ⅜ in. locomotive firebox steel reinforced to ¾ in. thick for a distance of 2 ft. above the firebrick lining. The economizer, or secondary heating surface, is unique in design, and is so arranged that the cold air direct from the fans strikes it first, thus creating a maximum temperature difference between the flue gases and the air. Being placed behind the firebox the radiant heat from the firebox cannot reach this secondary heating surface.

To heat water for the swimming pool and showers, and to heat toilets, offices and vestibules, a 180 H.P. steel

(*Continued on Page* 70)

Fig. 5. View in Fan Room Showing Three of the 120-In. Fans

A New Slant on School Ventilation

by **J. H. WALKER**

Superintendent of Central Heating and Assistant Chief of Research
The Detroit Edison Company

THE continued discussion of school ventilation methods and the controversies between the advocates of different methods are having the beneficial result of stimulating everyone concerned toward the improvement of that particular type of system which he is sponsoring. Undoubtedly a steady improvement in the art is taking place. However, it must be admitted that the present method of progress, which might be called the method of attack and defense, is not producing the best or the speediest results.

To one who has observed the developments and has followed the controversy without being directly involved, there appears to be another method—another avenue of progress—which if followed would produce much better and quicker results. Viewed from this angle the explanation of the semi-failure of many systems seems so obvious and the remedy so simple that the present conditions appear all the more regrettable.

The remedy proposed is the assumption *by the school boards* themselves, and their staffs, of their proper responsibility for the operation of equipment, which inevitably will lead to pronounced improvement, not only in operating methods, but in design and installation.

No one will deny that the actual results obtained in many school ventilating systems are poor. The obvious correctness of many of the criticisms voiced by Miss Ingels in THE HEATING AND VENTILATING MAGAZINE for March, and her indictment of present methods, as viewed from the standpoint of practical results, are illustrative of the unsatisfactory state of the art.

It certainly is true that we sorely lack accurate knowledge of actual room conditions. Every designer possesses a certain amount of design information from what might be called the office viewpoint. He can compute heat losses and duct friction and pipe sizes. But how much do we know of such things as proper thermostat location; of thermostat characteristics; of the actual variation of effective temperature throughout the room; of window chill?

What first-hand information have most designers about permissible air movement (and methods of measuring it), and about air distribution, recirculation and ozone? Opinions, certainly; arguments, in profusion; but very little data.

In most industries the process of perfecting a product consists of studying the performance of each successive model and eliminating the defects step by step. In the case of school ventilation such a process involves comprehensive research work, not only in the laboratories of the manufacturers who supply the equipment, but field research to study the finished assembly and its operation. At present when this is done at all, it is done almost entirely by the designing engineer or the manufacturer.

The designing engineer often does this sort of research. He usually checks up the adjustments of dampers, etc., and sometimes formulates a set of operating instructions. He, as a rule, makes a conscientious attempt to improve his designs and to add to his knowledge. But he is far removed from the day-to-day operation and, working as he does for a fixed and none too large fee, he has no great incentive to progress. If he does progress, it is usually along the development of his chosen type of system.

Secondly, there is the manufacturer of apparatus. He should, and actually has, contributed much. But as long as contracts are awarded to the lowest bidder on the basis of merely elementary specifications, the manufacturer will not over-exert himself to produce refined and probably more expensive equipment. And, moreover, the success of a ventilating system depends not only upon the quality of its parts, but upon the manner in which they are assembled.

The problem fundamentally is an operating problem. The most perfectly-designed system that can be installed is a failure if not properly operated day by day; and improved design naturally would follow as a result of operating experience carefully gained and intelligently applied to design.

True responsibility for proper operation rests with the school authorities and their staffs. Their facilities for observing operating results place them in a much better position to contribute toward certain lines of improvement in design than any of the other parties involved. Some of the things that are sorely needed are:

1. The development of a higher grade of operating staffs in the schools.
2. More effective pooling of experience throughout the country and the organization of cooperative research.
3. Evolution of proved designs, more or less standardized but adaptable to local conditions.
4. Organization of means for the assistance of school boards in smaller cities which cannot maintain adequate staffs.

The ventilation problem must be recognized as being an intricate and delicate one, calling for a high order of technical skill. It involves human psychology, as well as delicate physical and physiological considerations. A similar problem in any industry would warrant the application of the highest type of scientific brains. More technical men on school-board staffs urgently are needed.

Furthermore, in many non-competitive industries, great progress has been made by the exchange of operating experience and the carrying on of joint research. It is difficult to think of anything less competitive than school development and much good could be gained by better cooperation.

Fig. 1. Concrete Base Drain with Return Line in Place

New Mains for Central Heating System in Akron

by **P. A. HYDE**

Superintendent, The Akron Steam Heating Company

DURING the season of 1928, additional mains were laid to the already existing district heating system in Akron, O., and there was considerable discussion as to the type of construction to use both for insulation and the conduit around the pipe. Inasmuch as a return line system is now in use in this city, the problem of taking care of the return line efficiently and without undue width in the trench was given considerable consideration. It was finally decided to use the type of construction shown in Fig. 6.

The concrete base or gutter in which the return is placed, was built of a mixture of concrete using a 1-2-4 mix with enough calcium included to aid in setting up the concrete quickly. Pea gravel was used and the whole mixture, of exceptionally thin consistency, poured into the form. Steel forms were used for this construction and it was the general practice to lay about 250 feet of form at one stretch so that it could easily be poured in about two hours' time. The concrete was allowed to set for at least ten hours,

Fig. 2. Bottom Half of Steam Main Tile Cemented in Place

Fig. 3. Steam Main in Place, with Crushed Rock Around Tile

Fig. 4. Installation Completed, Ready for Back-Filling

Fig. 5. Main and Return in Same Tile

after which the forms were removed without difficulty.

Next came the placing and welding of the return line, the return being supported by cast-iron saddles and rollers. After the return line was welded the regular Ric-wiL base drain was placed on the concrete base and the bottom half of the tile laid. Then the bottom half of the tile was placed in position and cemented coarse gravel was then poured around the tile to within one inch of the joint. It was found, after some experimenting, that it was not advisable to lay the steam main until this crushed rock had been placed around the tile.

The steam main was laid on cast-iron supports and rollers, the supports being 15 ft. apart. No alignment guides were used. Laying the steam main was the next operation, and as soon as the main was welded the insulation was placed in the bottom half of the tile. The next crew came along with the top half of the tile and the filler was then packed in and the joints cemented. Particular care was used to see that the bottom half of the tile and the top half matched exactly. When the tile were split each section was numbered and the writer believes that this is half the secret of this type construction —to see to it that the tile matches exactly.

The type of filler used for insulation is what is known as long fiber African asbestos. Great care was used and rigid inspection made to see that the proper amount of filler was used for a certain size pipe and section of main. The inspector also saw to it that the filler was not rammed in the tile too tight, as the effectiveness of loose-filler type insulation is greatly retarded if it is packed in too tight. After the filler was placed, the bell ends of the tile and the Loc-liP side were cemented and allowed to set for at least five hours, after which the ditch was filled.

All expansion joints placed this year were hung from I beams in the manhole, and beams built in with the manhole construction. All of the manholes were built of brick laid in cement mortar. Expansion joints are bolted to the I beam and quite naturally hang upside down. So far we have experienced no trouble whatsoever with this type of construction which has the following advantages:

In nearly every manhole we have room enough for a man of average height to stand erect and pack an expansion joint.

It gives ample access all around the joint to make a thorough inpection.

One weakness that might be pointed out is the possibility of the I beam rusting off flush with the brick wall of the manhole, but the writer believes that this can be taken care of by a rigid inspection and the proper application of waterproof paint.

Expansion joints on the return line are hung directly beneath the steam main expansion joints and this cuts down considerably the expense of welding, as there is no necessity of making off-sets in the return line to get around a steam expansion joint.

Wherever possible, services are taken from the service connection provided for on the expansion joints and a valve placed in the manhole so as to control that particular service from one location. We have been careful to take services across the street large enough so as to be able to supply the maximum amount of radiation from one service so as to reduce the number of street cuts. For instance, one 4-in. service laid across one of the principal streets in Akron takes care of seven customers with a total of approximately 40,000 sq. ft. of radiation, branch lines being extended through the various building basements to take care of the different customers. All services wherever possible are laid using the same type of construction as the steam main with the exception that the steam and return are both laid in the same tile. No services less than 3-in. in size or over 5-in. are taken into any one building and we have found that the 3-in. service

with a 2-in. return gives ample supply and steam pressure for the average heating system.

Wherever necessary, steam mains are dripped with traps which discharge into the return line. The same method of dripping is used on the steam services.

The writer has found that it is decidedly an advantage, both from the maintenance point of view and from appearance, to use all welded fittings. No cast-iron tees or crosses are used, such fittings being made up in the field as the welder lays out his work. At the present time it seems that no flanged fittings of any kind will be used in future construction for steam service connections in our company's lines. In fact we have no cast-iron crosses, tees, or elbows in any of the steam mains laid during 1928. So far, with over three miles of piping varying from 15 in. down to 6 in. in our mains, we have the first bad weld to make its appearance. Electric welding was used throughout.

Steam pressures available at the service valve at the present time do not exceed 100 lbs.

A few words as to how the concrete base is standing up since its construction. We have had numerous occasions to cut into the main steam line for service connections and have found the concrete base to be in a remarkably fine condition. The concrete is a great deal harder in most cases than the concrete base usually found in the ordinary paved city streets.

We have experienced very little difficulty in connecting steam services at any point along the line. However, we were careful not to take a steam service connection off too close to a steam-main expansion joint. In case the connection was too close to the joint, we generally made the connection at the joint itself and provided for expansion of the service connection by some other means.

The effectiveness of the insulation of our lines is evidenced by length of time that snow remains unmelted on the pavement over the mains. It has been noticed that where the top half of the tile has been removed from the steam line there is no evidence of the filler shattering away from the pipe or any indication that the lateral movement of the steam main has pulled the filler with it. Apparently, the main moves freely inside the filler and leaves it as it was originally packed in the tile.

The heating system, as it is now laid out, is arranged in a loop and valves are installed at proper intersections so that one portion of the line can be shut off and still maintain service in another section. All valves are extra heavy non-rising stem and wherever flanges are used they are of the Van Stone type. The return line is extra heavy wrought iron and the steam mains are of standard weight steel pipe.

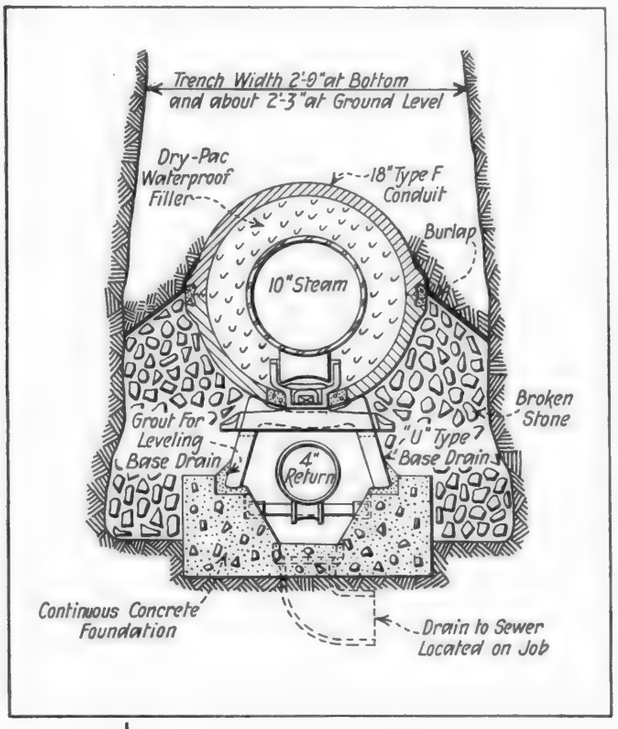


Fig. 6 (left) Sectional View of Conduit System

Fig. 7 (below) Typical Steam Service Connection

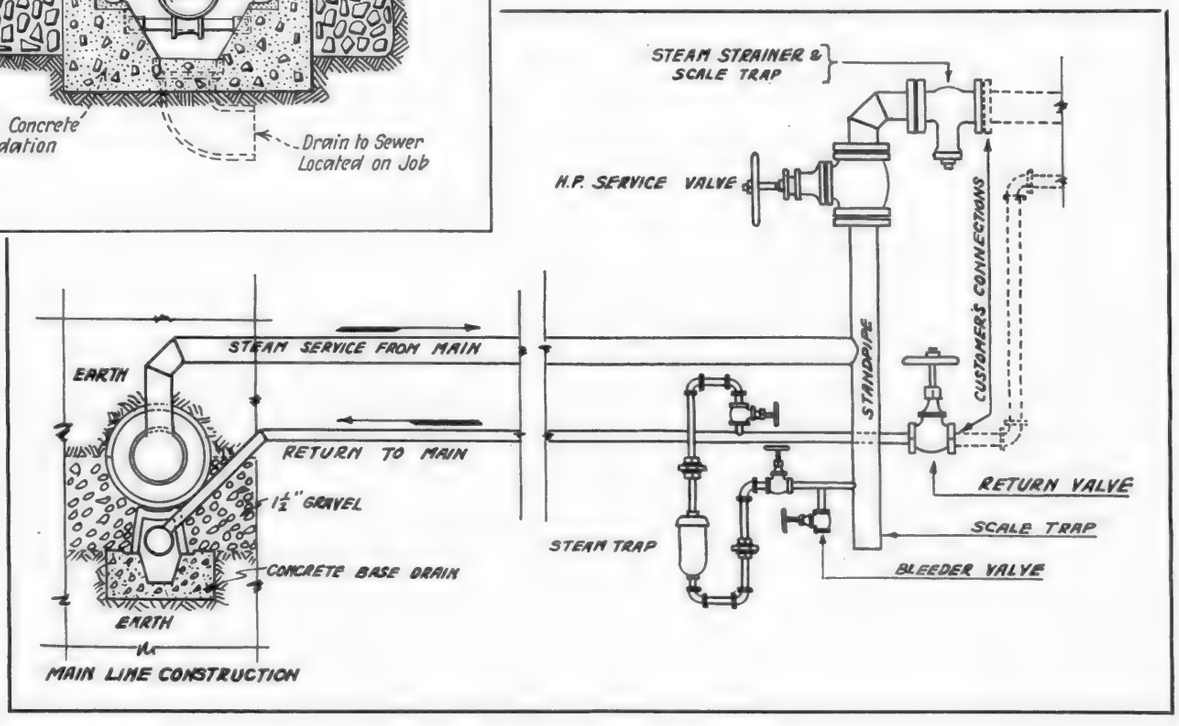


Fig. 8. Concrete Gutter with Base in Place

Fig. 9. Burlap over Crushed Rock to Prevent Fine Dirt from Filtering Through into Base Drain

Underdrainage of the steam line is drained to the manhole. The bottom of the manhole is connected directly through a Pea trap to the sewer. So far we have experienced no difficulty with this type of drainage.

The type of construction used during the season of 1927, the first year the heating mains were installed in Akron was the hollow tile type of construction. Two-inch 85% magnesia cover was used with an asbestos waterproof jacket around the covering. The return line was installed in the same box with the steam main but was not insulated. The sizes of the mains installed the first year are 15 in., 14 in., 12 in., and 10 in. There is no question but what the hollow tile type of construction lends itself well for heating mains of this size. The writer believes it is exceedingly cumbersome to use split tile for steam mains over 10 in. in size.

Valuable Data in New Bulletin on Warm-Air Research

THAT the comparison of heat losses from uninsulated floors and ceilings with those from insulated floors and ceilings on the basis of heat transmission coefficients before and after insulating is most misleading, is one of the striking conclusions of the authors of the latest bulletin on warm-air research issued by the University of Illinois. This bulletin, No. 189, constitutes Part IV of the "Investigation of Warm-Air Furnaces and Heating Systems."

In the warm-air research at the university tests were made in a room before insulating the floors and ceiling and after applying two ½-in. layers of quilted insulation. The results showed that the saving in heat was by no means as great as the difference in heat transmission coefficients alone would indicate. The reason is that since the flow of heat is directly proportional to the temperature difference, there is no saving unless the ratio of the coefficients of heat transfer is greater than the ratio of temperature differences, air to air.

For a given combustion rate it was shown that the furnace and top-of-chimney temperatures were practically the same for both hard and soft coal. However, to maintain a given temperature in the house it was necessary to burn the soft coal at a much higher combustion rate than the hard coal. With the outside temperature at 0°, to maintain 70° in the residence it was necessary to burn the soft coal at a rate which gave a furnace temperature of 760° against 570° for hard coal. Consequently, the flue loss is much higher when burning soft coal than when burning anthracite.

Among the interesting and valuable data reported were the observations that led to the conclusion that only in extreme cold weather was the flow of heat outward through the roof when the sun was shining. For weather warmer than 17.5°, the flow of heat was inward through the roof when the sun was shining. During periods of sunshine the heat loss from the ceilings of the residence was lessened approximately 27% as compared with periods of no sunshine.

An investigation into the fuel consumption and economy was made using six different types of fuel—anthracite, by-product coke, Illinois high ash bituminous, Illinois low ash bituminous, Pocahontas, and Kentucky bituminous. The conclusions were that Pocahontas coal possessed the greatest number of economical characteristics, such as least tonnage, least ash handling and least cost. Soft coal, having the lowest unit price, was not the cheapest coal for the season and required the greatest tonnage. This fuel, although unsatisfactory from the standpoint of smoke, soot, ashes, and low thermal efficiency, has one advantage, quick ignition with rapid acceleration of the fire.

When Bulletin No. 141 of this series was issued some years ago, the then startling announcement was made that insulation of the leader pipes with reasonable thicknesses of insulation failed to decrease the heat loss. Further tests, reported in Bulletin No. 189, confirm the conclusion that "insulation does not effectively increase the heat delivered by the pipe."

The bulletin, by Arthur C. Willard, Alonzo P. Kratz, and Vincent S. Day, is published by the Engineering Experiment Station, University of Illinois, Urbana, Ill.

Training the Apprentice Steamfitter

by **A. BACHMANN**

Secretary, Heating and Piping Contractors Cincinnati Association

Ohio Mechanics Institute, Cincinnati, Ohio

COURSES for apprentices in steamfitting at the Ohio Mechanics Institute were begun in January, 1928, and their success up to this time demonstrates the soundness with which they were planned.

The institute, an endowed technical institution, not conducted for profit, is located in the heart of Cincinnati. It has been offering training in technical lines for one hundred years. Because of its central location, and particularly because of its reputation, representatives of the employers and of the unions believed that the institute should be approached to learn if it could add courses for apprentices in steamfitting.

Discussions began early in 1927, looking to this end. It was learned that the institute authorities were willing to take on the additional classes. The institute had been offering for many years a course in steam heating and ventilating in both day and evening classes and the faculty possessed the necessary technical knowledge. The physical equipment and necessary apparatus also were available, not only to begin the classes but to carry them on to as advanced a grade as might be desired.

After many meetings of representatives of the institute, the unions and the employers, a schedule of training to continue for several years was planned. Because of the carefully laid plans, and the careful following up of the work by the representatives of the employers, both with regard to content of course and to attendance, the interest of the apprentices in the course has never waned, and the reputation of the course has improved month by month.

It was realized that a matter of great importance was the selection of instructors. The four instructors who give the training, in accordance with accurate specifications of the content of the course, are young mechanical engineers who practice daily the work they teach these young men in evening classes. The care exercised in the selection of these instructors has been justified by the results. Meetings are held between the instructors and the representatives of the employers and of the institute at frequent intervals to discuss possible changes to bring about better methods of instruction.

President John T. Faig, of the Ohio Mechanics Institute, is a graduate in mechanical engineering of the University of Kentucky. He has taught in the mechanical engineering department of the University of

Electrical Engineering Laboratory at the Institute

Michigan, the University of Kentucky, and the University of Cincinnati. He left the latter institution to become the head of the Ohio Mechanics Institute, and has had experience in laying out heating plants and in the teaching of heating and ventilation, so that he is eminently qualified to supervise the course for steamfitter apprentices.

The plan of having evening classes, two nights a week, from 7:30 to 9:30, has succeeded well, with an attendance record that is excellent. The classes are small with about sixteen students to a class, making it possible to give considerable individual instruction to each student. The instructors and students are all thoroughly interested, and there is every indication that the classes will continue to grow and to prosper.

Many day and evening courses are offered at the institute. In general, its advanced day courses are two years in length. Its various courses cover too many subjects to permit a complete list here, but include mechanical engineering, steam engineering, heating and ventilation, chemistry, physics, architectural drawing, blueprint reading, building estimating, oxy-acetylene welding and electric arc welding.

The shop and laboratory facilities are excellent, and the experience of the institute in arranging courses for apprentices and young workers has been long and varied. The institute teaches something over 1200 students a year, two-thirds of them in evening classes. The average evening student is a fraction over 22 years of age, although the ages range from 15 to 55 years.

From the steamfitter's point of view, the fitness of the institute to plan and carry on training for apprentices in steamfitting is due to the experience of the school in the teaching of steam engineering and mechanical engineering generally, in the engineering talent in its faculty, and in its willingness actively to cooperate with the employers and the unions to develop a fine spirit among the apprentices. Further, the general facilities and equipment of the institute will permit, in the future, the almost unlimited development of the scope of the training.

For the present, the schedule of subjects offered to the apprentices has been practical, and is intimately related to the business of steamfitting. It is realized that the purpose of training apprentices is to make them superior craftsmen, and not to make them mechanical engineers. They should be capable of reading drawings, obtaining from a set of prints information about the operation of the system, taking off pipe lengths and sizes of fittings, calculating weights of pipe and contents of piping and of tanks, and understanding the action of various traps and steam specialties that steamfitters install. The apprentice secures on the job actual mechanical craft experience, while in the apprentice classes he is given the simple technical information that he must have to be a satisfactory and competent worker by developing his skill and intelligence so that he need not fear loss of employment.

The classes during the first thirty-six weeks' work study the subjects mentioned in the foregoing paragraph, and in addition, some simple mechanical drawing. This is intended to teach the apprentice to make a sketch understandable in the shop.

So far the textbook used in the course is the "Standard Text on Steamfitting," published by the apprenticeship service department, Plumbing and Heating Industries Bureau, in conjunction with the Heating and Piping Contractors National Association. The various paragraphs are scheduled, so that the students have some preparations to make for each class period. Many questions arise in the course of each apprentice's daily work, which he has a chance to put to his instructor during class periods. Such questions grow into discussions that serve to

Library Reading Room

Class in Oxy-Acetylene Welding at the Ohio Mechanics Institute, Cincinnati, O.

interest the entire class and give each apprentice a new appreciation of the interest and importance of his vocation.

The various units in the textbook are not taken in the order given in the book, but in an order planned to give the best results with the apprentices in Cincinnati, considering their previous education and experience. A number of trade catalogs have been issued to the classes to supplement the textbook, and models and sections of valves, and other material of value in teaching, are used in the classroom.

A fine power plant, piping, heating and ventilating system is frequently used to illustrate various points in design and erection. A well-equipped library on heating and ventilation, and the leading journals of the industry, are available to all apprentices.

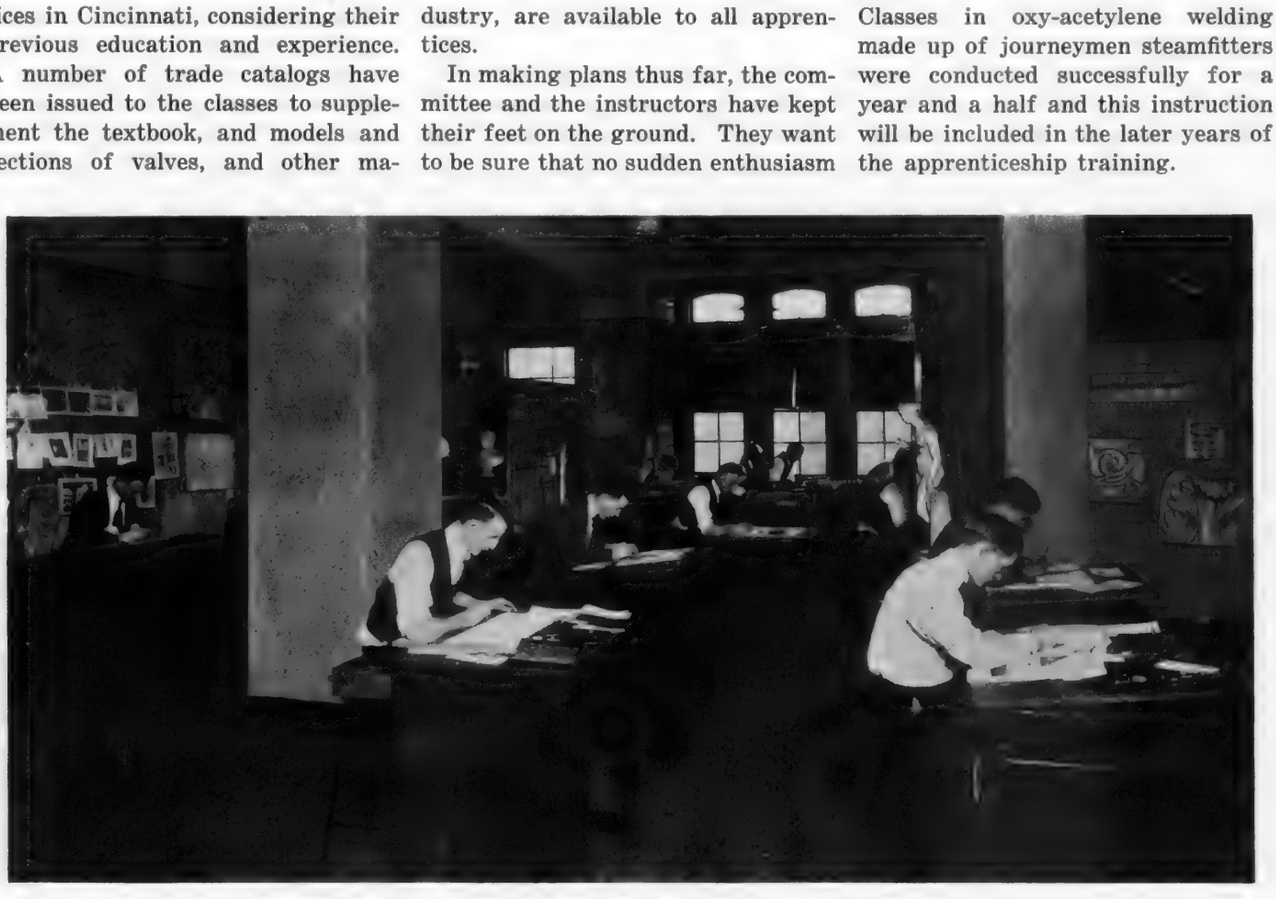
In making plans thus far, the committee and the instructors have kept their feet on the ground. They want to be sure that no sudden enthusiasm shall lead them into classwork that is not of the proper character for apprentices. So far the classwork given has justified itself by the results obtained and the work for the coming year is being planned so that the apprentices may secure the greatest possible benefit from the time expended.

The following equipment in operation is included in the laboratory of the Ohio Mechanics Institute:

3 Babcock and Wilcox high-pressure boilers, with an elaborate system of piping to headers.
1 Vacuum pump for a Webster heating system.
1 Temperature regulating system.
1 Webster vacuum heating system.
1 Ventilating system.
2 Tandem compound Buckeye engines, piped to headers.
1 Skinner steam engine.
1 Air compressor.
2 Small steam engines (not in operation)
Several boiler-feed pumps.
Various traps.

Whether actual laboratory tests should be made on these devices is a matter for future decision.

The school is especially well equipped to handle classes in welding, both oxy-acetylene and electric. Classes in oxy-acetylene welding made up of journeymen steamfitters were conducted successfully for a year and a half and this instruction will be included in the later years of the apprenticeship training.



Drafting Room for Classes in Architectural Design and Heating System

Notes from an Inventor's Handbook

by **WILLIS F. ROYS**

INVENTORS and poets, poor things, are born, not made, both eternally reaching up to heaven to grasp that one star called Success.

The writer is the yard-wide, dyed-in-the-wool type of inventor. Anything from toothpicks to locomotives, no matter if he knows nothing about the art, he knows he can improve it, with the result that is aptly described in a prevalent sillyism, "He faw down and go boom."

As this article is for the edification or boredom of the heating craft, only inventions pertaining to that industry will be dwelt upon, and will be taken up under each item that he worked, dreamt of, and sweated over. Having no capital, except three healthy children, his bank account ranged from badly bent to broken, but to poets and inventors this is the usual inspiration that leads them on. At the time this inventor entered the steam-heating grind, he, like others, would scheme and toil to get contracts and thus allow him to sweat blood until he collected the final payment and turned it over to some material men, but only the two-pipe steam system was in vogue, which led to the first invention.

One-Pipe System

After installing a two-pipe job, a telephone message came (telephones were just coming into use), "Please come and fix one of my radiators, it hammers and bangs." Oh, that he had a dollar for every time that message came, and down he goes to the job, to find the radiator hot and quiet, not even a gurgle. The house-owner looks foolish and meek, the steamfitter looks wise and pompous —nothing the matter. The next morning ditto, only more so. Then Mr. House-owner insists that Mr. Steamfitter shall be present in the morning when the bang-banging is due.

The following morning Mr. Steamfitter, being anxious to please (the last payment being held up because of aforesaid bang-bang), came to abide with the vociferous member of his carefully-installed system. The fire is started and Mr. Bang-Bang arrives. Mental conditions are reversed, House-owner is pompous and triumphant, Steamfitter meek and subdued. For ten minutes the radiator protests loudly against some disease in its internals, then gradually goes from bangs to gurgles and finally stops protesting.

Of course, something is wrong, and after examining every conceivable reason without finding any excuse for the noisy behavior, Steamfitter decides to disconnect radiator for unseen defects. Aha, return valve seat is off the spindle and return water cannot leave the radiator. New return valve installed, radiator works perfectly, bill is paid, and every one should be happy and would be if Steamfitter was a normal being, but he is not. He is an inventor. If a radiator with the return valve stopped up will work, the condensation must go back through the steam valve and operate with only one connection.

Then experiments! An inventor's life is made up of eating, drinking, sleeping and experiments, with the last predominating.

Well, for days, nights and weeks one-pipe connections are tried until, Eureka!—make the steam pipe large enough and you don't need returns.

With all the blind faith and gall of the inventor, he induces a man living in Jamaica, Long Island, to put in a one-pipe job, and, believe me, it *was* a one-pipe job. The boiler was set in the center of the building, a steam pipe taken from the top and run with good pitch from the various radiators, no drips, no returns and it worked. Less pipe, less fittings, less labor.

In fancy, the inventor could see himself getting every job of steam heating in the country and flying in de luxe airplanes (only airplanes were not even dreamed of then). But with a caution not usually a part of an inventor's make-up he decided to consult with the well-known engineer, William J. Baldwin, before astonishing the world with one-pipe systems.

And with that condescending pity that one inventor has for another, William J. Baldwin took the writer to Wall Street and showed him a one-pipe job in a large office building which had been in use for some years, and gave information that one-pipe systems were quite common out West.

Nevertheless, that one-pipe idea was pushed and sold and Mr. Inventor's children wore $2 shoes instead of the $1.25 kind they had been accustomed to wearing.

Air Valves

Air valves filling with water and inoperative because of that condition have been a perennial nuisance. So many times were radiators "not heating" complaints traced to this defect that Mr. Inventor got busy.

Buying every known style and make, he tested all and found that

all air valves would hold water under certain conditions.

Then came experiments, headaches, and finally a ⅛-in air valve tapping was enlarged to ⅜-in. and the various valves were changed with the ⅛-in. hole supplying the valve enlarged to ⅜-in. In every case it was impossible to keep water in the air valve, for the ⅜-in. inlet was so large it would break the suction and water would not remain in the body of the air valve, and so this common defect could be remedied if the ⅛-in. was enlarged to ⅜-in.

Of course the invention could not be patented, but the trade would be so benefited that a gold medal and engrossed resolutions were the very least reward expected.

And so before that august society of A.S.H. & V.E., the improvement was laid and as far as the writer knows is still "laying."

Heat and Light

About this time electric lights were supplanting gas and kerosene lighting, but the rates were high. Wouldn't it be great to invent an apparatus which would give heat and supply electricity? *It would!*

The reader will be spared the harrowing details of making an engine using a 5-lb. pressure on one side of the cylinder, using the exhaust steam for heating, and making a condenser to exert a vacuum on the other side of the piston, but the contraption did run and developed enough power to operate a small dynamo.

High-powered salesmanship proved to a German saloon keeper that he could save enough money in a couple of years to pay for the installation and, after that, either his heat or light would cost him nothing.

The apparatus was installed.

The 110-volt lights gave a uniform brilliancy ranging from nothing to burning out. One minute his saloon was bright as day and then it was only by the use of long practice that his customers could find their mouths in the dark, and no artist on the vaudeville stage could shimmy as those lights would.

The German stood it for about one week. Then his vocabulary of cuss words was worn out, and heat and light from one plant was given interment in the inventor's well-filled graveyard.

Safety Boilers

A headline in the morning papers described an explosion. A cast-iron boiler had exploded, killing two and doing great damage. Here was a chance to benefit mankind and, incidentally, attract trade by having a boiler which would not explode.

The result was a boiler made of pipe, and if I do say it myself as shouldn't, no more economical boiler ever was designed. How many boilers ever made will carry their full rated load and the temperature of the gases, leaving the boiler register only 215° F.?

Never to be forgotten was the thrill and pride felt when, through the carelessness of a janitor, two safety boilers in a row of three apartment houses were put out of commission and the third boiler was temporarily used to supply all three buildings, *and it did it.*

The safety boilers would last about four years, then start to pit and leak. Competitors and cast-iron boiler makers soon got wind of this and gave the safety boiler a black eye that no application of beefsteak or leeches could eradicate, and another dream of opulence faded into the discard.

Corrugated Radiators

Visiting an old-time building on Centre Street, a long thin radiator about ½ in. thick, 3 ft. high and 10 ft. long was seen hanging on a wall. It was made of sheet-iron, riveted in many places. It worked well, heated the room, and after figuring glass, wall, and contents it showed up to be very efficient.

But it looked unsightly, principally because of its size.

Now if it could only be put through a machine and be corrugated. The same surface could be compressed into a radiator about 2 in. deep and 4 ft. long.

So simple.

Yet it took two years of hard thinking and truck loads of discarded attempts before a final corrugated workable radiator was evolved.

Again visions of Success and again an unseen factor gave the product a black eye. In fact, both optics were so badly damaged that poor Mr. Inventor could not see how to proceed with the manufacture.

The unseen factor was the process of welding the sheets, which so affected the metal that the condensation lying in the bottom of the radiators soon ate holes through them, and the second year of their use produced a crop of leaks which drowned all visions of Success.

Graduated Heat

"You must have the valve of your radiator all the way open or shut tight." Time and time again was this advice given to customers and then came their inevitable reply:

"But I want to close off part of the heat. It gets too warm with the radiator hot all over."

With this oft-repeated dialogue ringing in his ears, Mr. Inventor gets busy.

He takes a 50-sq. ft. radiator having a 1¼ in. steam valve and tries to control the amount of steam entering the radiator at 1-lb. pressure.

Even with the valve just cracked open, enough steam goes through to fill the radiator.

All right, take a ¾-in. valve.

A little better.

Then a ½-in. valve.

Better yet.

Then a ⅜-in. valve.

He found that a ⅜ in. valve, opened one turn, would fill a 50-sq. ft. radiator.

It was easy to get a small casting like the face of a clock, solder it on the body of the valve and put a pointer handle in place of the usual one.

The problem of steam graduation to supply radiators was solved.

Now, how about the return end, how to prevent steam from returns backing into the radiator.

Hectic days, sleepless nights, aching, protesting pocketbook. Again the thrill that only is given to an inventor when he sees the child of his dreams born and alive.

A radiator trap made of a cast-iron shell, with a strip of iron and brass riveted together so that the heat of the steam would curve the strip and close the return opening.

In fancy, Mr. Inventor could see the blue-stone sidewalk (they had no cement walks then) being worn away by the crowds pushing to buy this great invention, and he could

not make up his mind as to just how many millions he would accept for it.

As a great favor he condescended to allow one of the big consulting engineers to put the devices in one plant so he called on the well-known Alfred R. Wolff.

Well, Mr. Wolff didn't think the thing could be done and if it could he wouldn't adopt it until a number of installations were made and tried out for a few years.

After leaving Mr. Wolff, Mr. Inventor was willing to take a single million for his invention.

And he started out to sell graduated systems.

But the public couldn't see what a wonderful idea it was.

At last by cajoling and promising and reducing prices, a graduated heat job was installed in a West 24th Street apartment.

It was finished in midwinter. Tenants moved in.

Then!

The return trap expansion member, having limbered up by use would barely touch the place where it closed off, and started to vibrate.

And the vibrating trap on the first floor rear was clearly heard on the fifth floor front.

Not only that, but those traps had that brotherly feeling for one another and, when lonesome and longing for company, one would start vibrating. Some other distant trap, hearing the trembling call, would at once yearn to give a sympathetic answer and its little soul would vibrate. Oft in the starry night could be heard their harmonious rhapsody, or, should I say, "rapsody."

And the tenants raved and swore.

And the landlord repeated verbatim all that the tenants said, with a few choice remarks of his own, repeatedly declaring he had bought a heating system, not a pipe organ.

After disemboweling the return traps and putting on check valves the job worked after a fashion, but it was a poor fashion.

About this time the inventor was not sure but he would sell out for a little less than a million, for the reference from the 24th Street job was a good thing to forget about.

So, for a couple of years, in spite of the fact it was perfected and a few perfect-working jobs were installed, it was next to impossible to get contracts.

And the inventor sold his patent to Warren Webster for so much less than a million that the amounts should not be mentioned in the same breath.

Automatic Control

Now you come to the device that started the writing of this article.

If a graduated valve can control the heat in a radiator, all that is necessary for thermostatic heat control is to operate the graduating valve by a thermostatic device. That's all.

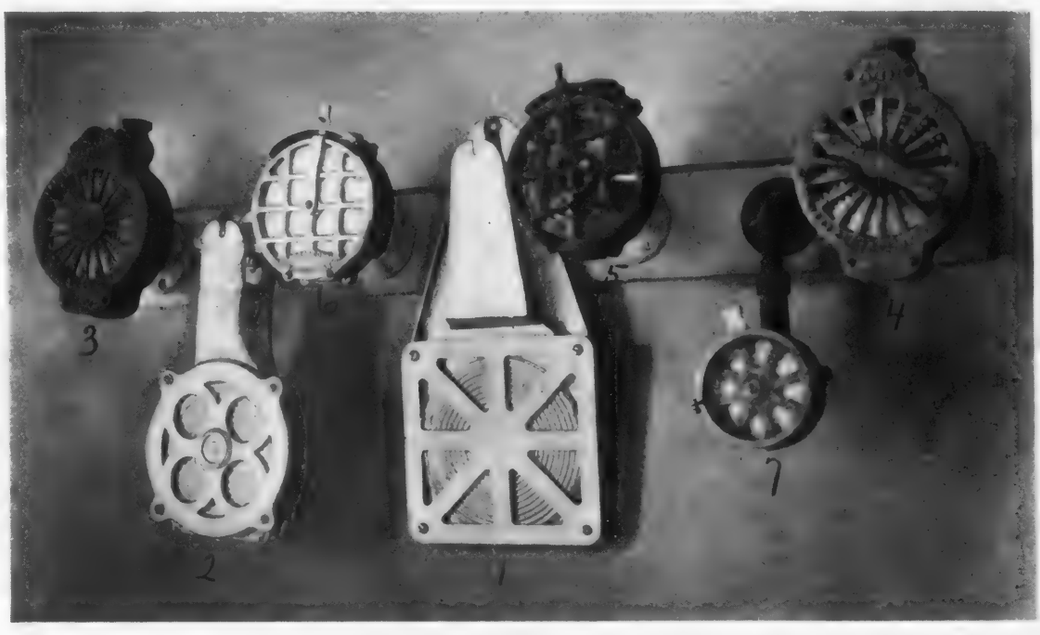
In Mount Vernon, N. Y., was a school that Johnson, of Johnson temperature control fame, had equipped with electric devices for heat regulation.

One inventor will never steal another's ideas, but it sure is convenient to borrow them, so up to Mt. Vernon I went to inspect the Johnson job. As a result he started on a new idea. Control the heat at and by the steam valve.

By lying on the floor and smoking until dizzy beside the various radiators of the home, the currents of air to and from each radiator could be determined, and by hanging thermometers on and around the steam valve, a fair record of temperature adjacent to valves was obtained, and a basis established for experimenting.

Alcohol, quicksilver, laminated metals, levers, cogs, pressure, vacuum, gases, something that would exert a pressure at a one-two degree variation of temperature. Finding a needle in a hay-stack was a job comparable to finding a suitable medium to operate a valve, but even the needle can be found if one works a couple of years looking for it, and the apparatus marked No. 1 in the accompanying illustration was made. Too big. Out of the question.

Some more lying on the floor and smoking and dislocating all joints and "busting" suspenders, and fighting with the wife, and the children wondering what kind of animal their father was.



Evolution of a Radiator Thermostatic Control

But Mr. Inventor found out that the air currents behind the radiator at a certain level were fairly uniform, so No. 1 was hung behind the radiator, adjusted to operate at a predetermined temperature, thermometers hung around the room, and hours of tense mental agony as records were kept.

Oh joy, oh rapture! It works!

Again were the blue-stone sidewalks to be worn by the thousands who would beg to buy this wonderful device.

And in the Lyric Theatre, New York, was installed the first of these heat controls. Among my treasures is a letter from the genial J. W. Jacobs, treasurer of the Shubert Theatrical Company, stating that his office temperature never varied throughout the first winter more than 2°.

But No. 1: The flexible diaphragm of rubber lost its life after one season's use, so another substance must be found. Celluloids, oiled silks, especially-woven fabrics, packings, at last coin silver with gold alloy, and that "But No. 1" is butted out of the picture.

But No. 2: No way to get at the control to repair or vary the resulting temperature. And so device shown as No. 2 in the picture was evolved to be hung in front of the radiator.

This so shocked the aesthetic taste of prospective buyers that it was soon discarded for No. 3 which could hang on the end of the radiator, was accessible and could be regulated with a screw-driver turning the little screw bolt in the center at the outer plate.

After weary but enthusiastic salesmanship, a plant was sold to a Park Row builder.

Winter comes.

Telephone message. No heat in my radiator.

Inventor goes to builder's office.

Radiator cold, except one end.

Inventor, triumphantly: "Sure, it's cold. Look at your thermometer, 71°."

Builder: "But I want heat in the radiator."

Inventor: "If you put more heat in the radiator, the room will go above 71°."

Builder: "You mean to say that I can't have my office warmer than 71° if I want to!"

Inventor: "Certainly you can. All you have to do is to take a screwdriver and unscrew that screw in the center."

Builder: "What! Get a screwdriver every time I want to change the heat in my room? Nothing doing."

Inventor: "But you bought an automatic heat control and you are getting what you paid for."

Builder: "I don't give a— (awful swear words). Take the d— things off."

For about an hour the inventor argues and pleads. Builder is adamant. He wants the radiator hot all over, and if room gets too warm he will open the window. "Take the things off or you won't get your money."

And a broken-hearted inventor stands on the sidewalk of Park Row undecided whether to take the d— things off, or buy a good keen razor and gleefully cut the builder's neck from ear to ear.

And No. 3 tenderly is laid on the shelf beside No. 1 and No. 2. Then, after many pains, No. 4 is born. This allows changing the range of temperature simply by moving the arrow.

Too big, ugly and clumsy.

No. 5 is much smaller, but lever-operating cam does not function well and must be improved.

No. 6 is much smaller, better-looking, nickel-plated and everything, but the public does not buy.

About this time, the Sterling Engineering Company, of Milwaukee, seeing that the device does automatically control the heat in rooms where it is installed, makes arrangements to manufacture and sell them.

They meet with the same criticisms that Mr. Inventor did. Looks odd, like a banjo or dish pan on the radiator, and other distressing or painful compliments.

The Salvation Army's slogan, "He may be down, but he's never out," applies to inventors. Weary months of patient endeavor, encouraged by the aforesaid Sterling Engineering Company, and No. 7, small, neat and effective, is hung on the strip with the cast-offs of fifteen years' steadfast confidence that a workable automatic heat control, within the reach of ordinary pocketbook-buying power, could be made.

And Mr. Inventor expects to see the day when automatic heat control will be as common as graduated heat is today.

By that time he will have perfected a cooling apparatus to keep houses cool in summer!

Butler University Field House

(Continued from Page 58)

boiler is used. The boiler is placed in the heating oven with the furnaces without covering, and the flue gases from the boiler are passed through an economizer.

Experience has shown that the uniformity of temperature distribution from one point in a room depends almost entirely upon the volume of air circulated. In most rooms a complete change of air each ten minutes is required for an even temperature, but in the field house, where the cubical contents are large in comparison with the heat loss, one change each 15 min. is sufficient. This is accomplished with four modified cone type fans which have the characteristics of large air delivery per horsepower at low pressures and low velocities. Each fan is belted to a 10 H.P. motor.

Dampers are placed at each warm-air outlet so that any room or combination of rooms may be heated without heating others, and outside air openings of large area with dampers are provided for temperature control and the removal of odors, smoke or excess moisture. Inasmuch as the swimming pool and gymnasium are used more frequently than the field house room, it was estimated that the waste heat from the steam boiler, while heating offices, toilets and water for the pool and showers, would be sufficient to warm the two rooms in mild weather. By placing fan No. 1 directly behind the boiler and economizer with dampers to close off the connection with the other fans and the main field house room, this is possible. As the weather becomes more severe one or more of the furnace units is used.

Details of the performance test on the system will appear in next month's issue.

Maurice L. Bein, Architect

Chicago Apartment with 7227 Sq. Ft. of Radiation, Equipped with Dual Heat Control

Controlling Oil Burners Automatically by Outdoor Temperature

by **F. I. RAYMOND**

President, F. I. Raymond Company

REDUCED to its simplest terms, the primary purpose of the heating plant in any building is to supply heat to the building to replace that lost to the outdoor atmosphere. When the building is losing heat at a high rate the heating plant should supply heat at a high rate, and when the building is losing heat at a low rate the heating plant should supply heat at a low rate. There are other purposes of the heating plant such as supplying extra heat for warming up in the morning, and, in many cases, supplying heat for the domestic hot water supply. However, the primary purpose of the heating plant remains that of supplying heat to the building to replace that lost to the outdoor atmosphere.

Whenever we are trying to maintain the temperature inside the building constant, the rate of heat supply should equal the rate of heat loss. When we want to raise the temperature in the building the rate of heat supply should be greater than the rate of heat loss, and when we want to reduce the temperature in the building the rate of heat supply should be lower than the rate of heat loss. This statement of the basis of space heating is self-evident, but it is because I believe that it has not been given proper consideration in the past that I set it down here. It is, as I see it, the point from which we must start on our problem of automatic heat control.

The rate of heat loss in any building is directly proportional to the difference between the temperature indoors and the temperature outdoors. Other factors such as wind, rain, sun and the habits of the occupants also affect the rate of heat loss, but their combined effect is small in comparison to that of the outdoor temperature. Moreover, I believe they tend to counterbalance each other, as I will point out later.

The rate of heat *supply* to any building using radiator heat is directly proportional to the difference between the temperature of the radiators and the temperature of the rooms.

Based on these two premises as to the rate of heat loss and the rate of heat supply, a system of automatic control for oil burners has recently been developed and used successfully under which the radiators in a building are constantly maintained at a temperature which is proportionate to the outdoor temperature.

To accomplish this result a new type of compound thermostat is used to start and stop the burner. This compound thermostat can be likened to an aquastat in which the shut-off point is automatically reset by the outdoor temperature. Actually it is a thermostat which has two temperature bulbs filled with liquid, both of which are connected by fine tubes to the same thermostat head. The shut-off point of the thermostat is then the combined temperature of both bulbs instead of that of either one.

One of these bulbs is placed outdoors and the other is attached to a radiator in the heating plant, the location of which will be described later. The compound thermostat then starts and stops the oil burner in response to changes in the combined sum of the outdoor temperature and the radiator temperature.

Thus on a cold day it will require a high temperature in the radiator to start and stop the burner, whereas on a mild day it will require only a moderate temperature in the radiator to start and stop the burner. This means that on cold days we will have hot radiators and on mild days we will have only moderately warm radiators, which is precisely what we want.

In these systems the indoor bulb of the compound thermostat is clamped onto the outside of the last radiator on the last riser on the longest steam main. The reason for this location is to insure that every other radiator in the system will have steam before the last radiator can

Presented at the Sixth Annual Convention, American Oil Burner Association.

turn the fire off. The other bulb of the compound thermostat is then placed at any convenient location outdoors which gives a representative temperature. It must of course be shielded from the sun and should wherever possible be located on the north side of the building or the roof.

The compound thermostat used for these steam systems has an outdoor bulb whose volume is twice that of the radiator bulb. This means that for each 1° rise in outdoor temperature the temperature at which the radiator will shut off the fire will be reduced 2°. Thus at 0° outdoors, if the compound thermostat is set at 220°, it will require a radiator temperature of 220° to shut off the burner. At 20° above zero a radiator temperature of 180° will shut off the fire. At 40° a radiator temperature of 140° will shut off the fire.

And so on until at 70° outdoors a radiator temperature of only 80° will shut off the burner.

Of course there is no such thing as a steam temperature of 80° and even 140° is hardly practical. But it should be remembered that the bulb of the compound thermostat is subject to the temperature of the radiator rather than to the temperature of the steam in the radiator.

Dual Control Device Mounted in Small Office of the Apartment

An example will show how it operates.

On a day when it is 40° outdoors, for instance, the shut-off temperature at the last radiator will be 140°. Therefore, when we start up in the morning the burner will operate until the steam is forced throughout the mains and up to the last radiator. At this time the pressure at the boiler is usually from ¼ to ½ lb. As soon as this steam raises the temperature of the last radiator to 190° the burner will be shut off. The steam at 212° will heat the radiator up beyond 140° after the fire is shut off, but it is surprising to find it does not heat it up to 212°. The minute the burner is shut off the pressure drops in the boiler and condensation in the system causes a vacuum. This vacuum expands the steam, thereby reducing the temperature considerably. Moreover, the change in pressure seems to cause a partial condensation. Under this action the radiators must be filled with a sort of steam fog, for their temperatures are much lower than would be indicated by the pressure at the boiler. In any event the burner will stay off until the radiator cools down to 140°, at which time the compound thermostat again turns it on.

During this off period the vacuum in the system will often build up to 8 or 10 in. This is very beneficial in the case of one-pipe steam systems where one radiator is inclined to be air bound. If that radiator did not get any steam during the first firing period the vacuum in the system during the off period draws some of the trapped air in the radiator down into the steam main. When the fire comes on again this air is forced along the steam main and out through the vent at the end of the main. As the pressure rises again

Oil Burner and Steel Boiler in Apartment Illustrated

Outdoor Bulb Protected by Metal Shield

in the system some steam enters into the radiator which formerly was air bound. After several cycles of pressure and vacuum all the radiators balance up to a surprising degree, and the distribution of heat is remarkably even throughout the building.

It will be seen that in cold weather the firing periods will be long and the off periods will be short. As the outdoor temperature rises, the firing periods will become shorter and the off periods will be longer.

It will be apparent that we must set the compound thermostat high enough to produce radiator temperatures which will heat all parts of the building to 70° when there is a high wind and no sunshine. This will produce a slight degree of overheating in calm weather when the sun is shining.

However, it will be the tendency of the occupants of a building to open windows for fresh air on calm sunshiny days, whereas on windy days there will be a tendency to keep the windows closed. On this account I believe, as stated previously, that the effect of wind, rain and sunshine is largely counterbalanced by the human element.

Under this system of control the rate of heat supply is always held in close equilibrium with the rate of heat loss. The radiator temperature may vary considerably over the period of an hour but the average radiator temperature during any one hour will be very close to the average radiator temperature during any other hour. As a result the temperature will be maintained at a very uniform degree in any part of the building. The apartment owner can readily control his temperature by his favorite window method and he will not complain of cold radiators.

It will no doubt be quite obvious that instead of using the compound thermostat described, one could use an ordinary aquastat or hydrostat of the clamp-on type and rely on the janitor or attendant to reset this aquastat by hand to meet his requirements. This arrangement would not be fully automatic but it would enable the janitor to control his heating plant far more successfully than he now can by adjusting the pressure control.

Oil Conservation and Its Relation to the Oil Burner

A CONFERENCE of governors of oil producing states was held in Colorado, June 10, with representatives of the Federal Oil Conservation Board and American Petroleum Institute present, to discuss an interstate compact as a means for bringing about conservation of the nation's oil supply. At this conference, called by President Hoover, such a compact may be developed, although Secretary of Interior Wilbur states that general principles, rather than a specific form of compact, were discussed.

So far as the conservation program will affect the domestic oil burner, an editorial entitled "Conservation and future Burner Oil Supply," which appeared in *National Petroleum News* for May, 1929, allays any uneasiness on the part of those who feel that the nation's oil supply may be so low as to make the future of oil burners uncertain. The editorial follows:

The widespread agitation for limitation or control of crude production has given rise to some thought regarding the future stability of the supply of domestic burner oil. The Oil Heating Institute has received a number of inquiries as to the effect such a conservation movement would have on the supply of oil for house-heating.

Some question as to future prices has been expressed by consumers, jobbers handling various grades of burner oil and manufacturers of oil burners. The latter class probably is more concerned than present consumers, since any fear of curtailment in burner oil supply would affect prospective burner installations more quickly than current consumers.

To allay this uneasiness it may be said that the supply of the best grades of furnace oil for domestic consumption could be enlarged many times beyond current demands as a direct result of the conservation movement.

Domestic burners in the northern states, particularly, require an oil which will flow freely at low temperatures. This is important if the oil seller is to be able to make deliveries in cold weather without the expense of special heating of the oil before it is loaded into tank trucks.

In the second place the ideal oil for domestic heating should have a relatively low flash point so that it will catch quickly from the pilot or electrical spark. This property of the oil aids thermostatic control and lighting co'd furnaces.

The supply of low cold test, low flash oils which can be produced by simple distillation of crude is quite limited. If the burner industry had to depend for the narrow cut of this product from crude, there would not be a great future for it.

However, the cracking process produces, or can be made to produce, a product which most people now believe to be superior to straight reduced furnace oils. The product consists of bottoms from pressure distillate rerun stills and recycle gas oil from the cracking plant itself.

The cracked furnace oils, from any crude, whether it originally had a high or low cold test, are desirable since they will flow freely at low temperatures. They likewise have a low flash point as compared with straight reduced oils.

Production of heavy fuel oils, industrial fuel, bunker oil and the like undoubtedly would be reduced under such a plan. But these heavy oils have been produced in quantities far beyond normal requirements. They have been competing with coal for business at low prices.

It should be remembered in connection with this discussion that the recycle stock and pressure distillate bottoms produced as a by-product of cracking, and valuable as house-heating oil, also have a gaso'ine value. They may be recharged or kept in the cracking coils and additional quantities of gasoline produced from them. The gasoline value of these products must necessarily exert some influence on furnace oil prices, particularly in times of an actual oil shortage. In times of surplus, of course the effect is more or less negligible. In general, however, and as far ahead as can be seen now, there will be ample supp'ies of oil for house-heating at reasonable prices.

How Solder Is Used in the Fabrication of Aerofin

Due to the omission of the word "not" in a note which accompanied the article on "The Evolution of the Light-Weight Heating Surfaces," by L. C. Soule, published in last month's June Silver Anniversary issue, the sense of the note was just the opposite of that intended. It should have read as follows: "Solder is not used, in our product at least, as a means of effecting the steam joint. The solder serves metallically to bond the extended and prime surfaces."

Legal Decisions

Uninstalled Heating Plant Placed on Premises by Contractor

Suit in replevin was filed by the seller to recover possession of a warm-air furnace and certain piping and other material located in the basement of a building purchased by the defendant, Rogers, at a foreclosure sale, held pursuant to a deed of trust executed by one Charles R. McClurg. The bill averred that at the time Rogers purchased the building, the furnace was not attached to the building, but that Rogers claimed that it passed to him as an appurtenance to the house and lot. The bill averred that complainant had delivered the furnace to the premises under a contract with McClurg for the furnishing and installation of such a furnace, together with the casing and piping incidental thereto; that when it had delivered the furnace and material to the premises "in pursuance of the carrying out of its said contract" but before the work of installing the furnace was begun, McClurg died, insolvent, and no further steps were taken to complete the contract, the furnace and materials for completing the contract being left on the premises, unattached, at the time of the subsequent purchase of the premises by Rogers; that the furnace was not appurtenant to the realty, and that title thereto did not pass from the complainant and was not to pass until the furnace was completely installed and made a part of the realty.

The Tennessee Supreme Court holds, Knoxville Tinware & Mfg. Co. v. Rogers, 11 S.W. (2d) 874, that if the contract did not fall within the application of the Uniform Sales Act, the delivery by the contractor of the furnace and materials on the premises where he was bound by contract to install them was a conditional delivery to McClurg, as bailee rather than vendee for the purpose of enabling the complainant to perform its entire contract.

Assuming, however, that the contract were treated as one for the sale of goods, the court said: "If a contract for the sale of unascertained or future goods by description requires the installation of such goods in a building, as in the case of a furnace to be installed by the seller, we are of the opinion and hold that the goods are not in a deliverable state, so long as the installation is incomplete; and in such case the property in the goods does not pass to the buyer until the goods are installed, under rule 4 [of section 19 of the Uniform Sales Act]. This construction of rule 4 places it in harmony with rule 2, in section 19 of the statute, which provides that under a contract to sell specific goods, whereby the seller is bound to do something to the goods, for the purpose of putting them into a deliverable state, the property does not pass until such thing be done.

"It is our conclusion, therefore, that whether the contract disclosed by the bill be treated as a construction contract for work and labor, or a contract for the sale of goods, the facts stated in the bill do not disclose a transfer of property from complainant to McClurg and that a cause of action for the possession of the property is stated in the bill."

A decree sustaining demurrer to the bill was therefore reversed, and the cause remanded for answer.

Vendee's Recourse for Breach of Warranty—Cannot Keep Furnace and Sum Paid on Account Also

A contract was made to install a furnace and pipes for the heating of a house for a contract price of $475, $79 to be paid at once and the remainder by installments of $33 per month. The furnace was installed and $79, with $20 for extras, was paid. The owner of the house then refused to make further payments. In an action on the note given therefor, to which one of the defenses was breach of a warranty in the contract that the furnace would heat the house to a certain degree of temperature, judgment was rendered for the defendant upon the note and also on his cross-petition for $99, the amount paid by him. This judgment the Ohio Court of Appeals reversed, Hirschl v. Richards, 162 N. E. 616, mainly because of error in charging the jury as to the doctrine of rescission of the contract and because the jury's verdict for the plaintiff was not sustained by sufficient evidence.

On these points the appellate court said: "Now the record shows that this furnace was installed under a contract of warranty, and the evidence from the experts shows that it would have cost in all about $50 to put this furnace in such a condition that it would comply with the warranty. It must be remembered that this furnace was installed, and still remains installed, in that house, and, so far as it appears, is doing the work for which it was purchased and installed. There never was any offer to return this property, and the result of the lawsuit is to the effect that the defendants have the furnace installed in their house and have a judgment to recover the money that had been paid upon it, and this too, it must be remembered, without any rescission of the contract, offer to rescind, or offer to put the other person in *status quo*. If there was a breach of the warranty as to what this furnace would do, that could be compensated as damages, but the defendant should have proven his damages, and would have been entitled to recoupment to that extent, and no more. In any event, he was not entitled to recover the money back and keep the furnace too."

Contractor Entitled to Extra Cost of Ventilator Installation

In an action to recover for labor and materials in remodeling a business block into an apartment house, one of the items in dispute was connected with certain substitutes for ten ventilators furnished in place of those specified in the contract, which substitutes the defendant claimed to be worthless. The Main Supreme Judicial Court, Leventhal v. Lazardvitch, 142 Atl. 781, refused to disturb the verdict for the plaintiff on this ground where the jury evidently accepted plaintiff's testimony that the substitution was done with the consent of the defendant and with his full knowledge, in which he was to a certain extent corroborated by his assistant.

Another item related to a change in the ventilation or method of carrying out the fumes of 70 gas ranges in the several apartments. The contract provided for hoods over the ranges and connections with air shafts running to the roof. The building inspector of the city of Portland, however, refused to approve of this method, and ordered 11 metal risers installed, running up through the building to the roof, to be connected directly with each gas range, and eliminating the hoods. The expense of this being much greater than for installing the hoods, because of a relocation of the ranges, the plaintiff was held entitled to a fair compensation for installing the risers and connections, regardless of the price for which he agreed to install the hoods with connections.

Airplane Views of Bigwin Inn, Lake of Bays, Ontario, Canada

Heating Engineers and Manufacturers Near Agreement on Boiler Rating

A DEFINITE step forward in the movement to formulate codes for testing and rating heating boilers was taken at the midsummer meeting of the American Society of Heating and Ventilating Engineers, held at Bigwin Inn, Lake of Bays, Ontario, Can., June 26-28. In addition to accepting the boiler test code promulgated last winter by the Boiler and Radiator Manufacturers Association, the society received a revision of the boiler rating code drafted by the Continuing Committee, the name under which the Committee on Interpretation of the Rating Code is now functioning. Due to the importance of the subject, definite action on the adoption of the code was deferred until the next annual meeting, when a more representative expression from the members can be obtained.

There were 141 members, 103 ladies and 56 guests, a total of 300, registered at the meeting, a remarkable showing in view of the fact that the meeting was held at a point so "far from the madding crowd," in the beautiful lake district of Ontario. Never before has the society met outside the United States, and never before has it held its meeting in such charming surroundings.

Under the direction of the president of the Ontario Chapter, M. Barry Watson, the Committee on arrangements, which was made up entirely of Ontario Chapter members, won the admiration of those present for their capable and well-directed hospitality.

As usual, the high spot of the entertainment program was the banquet, at which the principal speaker was Brigadier General C. H. Mitchell, dean of the Faculty of Applied Science and Engineering at the University of Toronto, and president of the Engineering Institute of Canada.

Nominations for officers of the society for 1930 were presented by the Nominating Committee as follows: For president, L. A. Harding, Buffalo, N. Y.; for first vice-president, Willis H. Carrier, Newark, N. J.; for second vice-president, Prof. F. B. Rowley, Minneapolis, Minn.; for treasurer, Cecil W. Farrar, Buffalo, N. Y.; for members of council (3 years), R. H. Carpenter, New York; John D. Cassell, Philadelphia, Pa.; Alfred Kellogg, Boston, Mass.; John Howatt, Chicago, Ill.

DUE to the fact that the midsummer meeting of the A.S.H. & V.E. was held at a time so near our publication date, it is possible to present in this issue only a summary of the report on the meeting. A more detailed report will appear in HEATING AND VENTILATING for August.

Ontario Chapter Welcomes Society to Canada

At the session Wednesday morning, M. Barry Watson, president of the Ontario Chapter, extended greetings from the Ontario Chapter to the visitors. The response was made by Thornton Lewis, president of the society.

In his paper "Instruments for the Measurement of Air Velocity," J. H. Parkin confined his subject to a consideration of certain methods for the measurement of air velocity under atmospheric or low pressure, the methods described being those for the determination of a velocity at a point. Among the instruments mentioned in the paper were pressure plate anemometers, cup anemometers, vane or screw anemometers, Pitot tubes, Pitot-Venturi tubes, and various types of manometers, the Chattock micromanometer and the Wahlen gauge.

"Analysis of the Overall Efficiency of a Residence Heated by Warm Air," presented by A. P. Kratz and J. F. Quereau, both of the University of Illinois, was based on data obtained in connection with the investigation being conducted by the Engineering Experiment Station of the University of Illinois in cooperation with the National Warm Air Heating Association. In their conclusions the authors stated that:

"The practice of comparing heating plants on the basis of boiler or furnace efficiency may be misleading. The efficiency of the heating unit and distributing system is important from the standpoint of delivering heat at desired points, but in a self-contained system, such as a residence, the vagrant heat by no means constitutes a dead loss. It raises the heating efficiency of the system as a whole, and generally serves to warm floors and walls where heat is desirable. When the overall house efficiency is considered, the actual heating unit efficiency becomes less important while combustion efficiency becomes more important."

An interesting description of an air-conditioning system in an office building was described by Hiram L. Walton and Leslie L. Smith. Excerpts from their paper follow:

Air Conditioning System of a Detroit Office Building

SIXTEEN stories and two basements of the Union Trust Building are heated and ventilated throughout by a combined air-conditioning and heating system. The National Bank of Commerce occupies the first five floors of the building which is 80 ft. wide by 270 ft. long, with three basements below grade. The trust company's offices occupy the seventh to fifteenth floors, inclusive, and part of the sixth. Provision has been made for the future occupancy of the sixteenth floor. The space occupied by the bank and trust companies, including the basements and sixteenth floor, is provided with a combined air-conditioning and heating system.

By an air conditioning system is meant a ventilating installation that is capable of supplying a warmed and humidified air in winter and a cooled and dehumidified air in summer, accordingly, as the comfort of the occupants may require. This is further termed a combined heating system when the air is delivered at such temperature as adequately to heat the space supplied. Direct radiation has been installed in the toilets and stairways of the floors in question, but the air conditioning system is depended upon for heating the remainder of the space. The space above the sixteenth floor is rental space and is heated by direct radiation of a semi-concealed type.

After the necessity of a ventilating system had been established, the question that required consideration was whether or not this ventilating system should be an air conditioning installation. The additional investment and operating costs could be estimated within such limits as would be required for factors affecting the adoption of air conditioning.

The additional investment was estimated at $130,000. The operating costs, exclusive of maintenance were estimated at $9,600 per year. Allowing annual fixed charges, including maintenance at 11%*, the total annual cost of the air conditioning feature over that which straight ventilation would have cost, amounted to $23,900. It will be noted that the operating costs do not include any item for attendance, it being concluded that the air conditioning would not result in any additions to the operating force.

Union Trust Building, Detroit

The conditions to be maintained in the building were established at a temperature of 70° F. and a relative humidity of 40% during the heating season, and during the summer a temperature not exceeding 80° F. and a relative humidity not exceeding 55% when the outside dry bulb temperature was 95° F. and the outside wet bulb temperature was 76° F. Normally for department stores and theatres in this locality, these limits are set lower (84° dry bulb and 73° wet bulb) and greater areas are tolerated.

The arrangement of these two systems with their supply and recirculating ducts, the velocities in them and outlet velocities, follow very closely that which may be considered standard practice. It was feared that with the high banking room open to the lobby, and with the elevators opening to this lobby, there might be objectionable drafts, and that it might be necessary to install a glazed partition between the main bank and lobby. Although the performance has not been observed under extreme conditions, the indications are that objectionable drafts will not be experienced.

The office system serving the seventh to sixteenth floors, inclusive, has two air conditioning units installed in the sixth floor machinery room, similar to those for the main bank system. One of these units serves the North half and the other the South half of these floors. The South unit serves a space having three exposures, — namely, East, South and West. A separate fan, with its supply duct system, has been provided for each exposure, the purpose being to have the system of ducts for any one exposure uninfluenced by variations in the leakage and wind pressure affecting the air

* Interest 6%, amortization 1.5%, taxes 1.5% on full value, insurance and liability 0.5%, maintenance 1.5%, total 11%.

supplied by the duct system for any other exposure. It is expected the flexibility of this arrangement also will be of advantage in summer conditions in compensating for the changing sun effect on the sides of the building. A heater has been installed on each floor for each duct system, which can be controlled to give air of the proper temperature to meet the heating requirements.

The air conditioning units for the office system are typical in their arrangement and operation of those for the three systems comprising the complete installation. These units draw outdoor air in through louvres at the sixth floor level. They also draw recirculated air back through the return air shafts connected to return air grilles on the various floors. Both the outdoor air and the return air enter a common chamber ahead of the dehumidifier where they are mixed to maintain a temperature above freezing. Part of the mixed air then passes through blast heaters and through the dehumidifier where it is washed and cleaned and its moisture content definitely fixed. The remainder of the mixed outdoor and return air bypasses the dehumidifier and enters the unit on the fan side. In the summer time the dehumidified air and the by-passed air are then mixed to obtain the required conditions of air delivered to the rooms. The dehumidifying is accomplished by CO_2 direct expansion coils installed as part of the air conditioning unit. During the heating season the process is the same except that the air is humidified.

By running two ducts in place of one for a part of the distance, it was found that the distributing ducts on

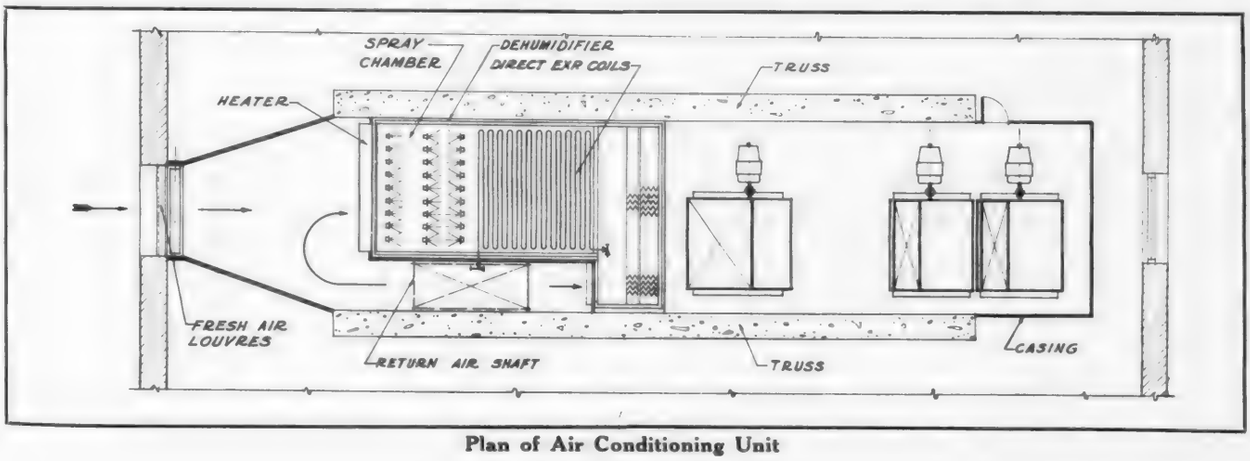
Heaters and Distributing Ducts

AIR CONDITIONING OPERATING COSTS

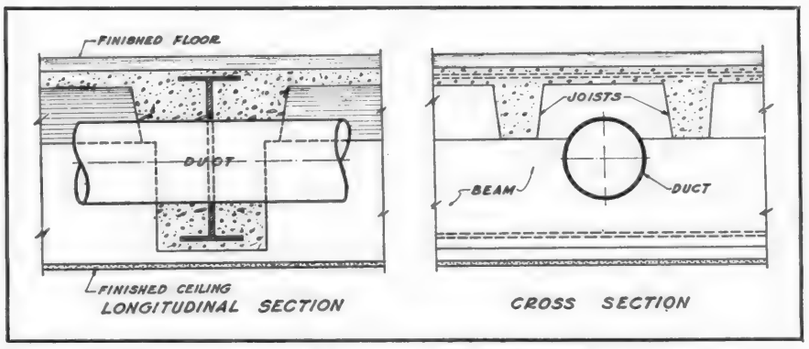
BASIS		
Capacity of refrigeration plant	600 tons	
Hours of operation assumed as	500 hrs.	
POWER CONSUMPTION		
Compressors (connected load)	650 H.P.	
Pumps	90 H.P.	
Total connected load	740 H.P.	
Kilowatt input	555 K.W.	
500 hrs. @ $0.02 per k.w.h.		$5,550
REFRIGERANT		
CO_2 @ 25 lbs. per ton per season @ $0.08 per lb. $600\times25\times.08 =$		$1,200
CONDENSING WATER		
Cost of water: $0.40 per 1000 cu. ft. Consumption based on 2.9 gal. per min. per ton with condensing water @ 70° F.		
$600 \times 500 \times 60 \times \frac{2.9}{7.5} \times \frac{0.40}{1000}$		$2,790
MISCELLANEOUS		60
		$9,600

CAPACITY OF INSTALLATION

System	Lower Bank	Main Bank	Office
Volume of space served (cu. ft.)	456,500	480,000	1,590,000
Number of people	450	410	2,610
Air supplied (C.F.M.)	69,000	74,000	150,000
Number of conditioning units	1	2	2
Air changes per hour	6.6	9.2	5.7



Plan of Air Conditioning Unit

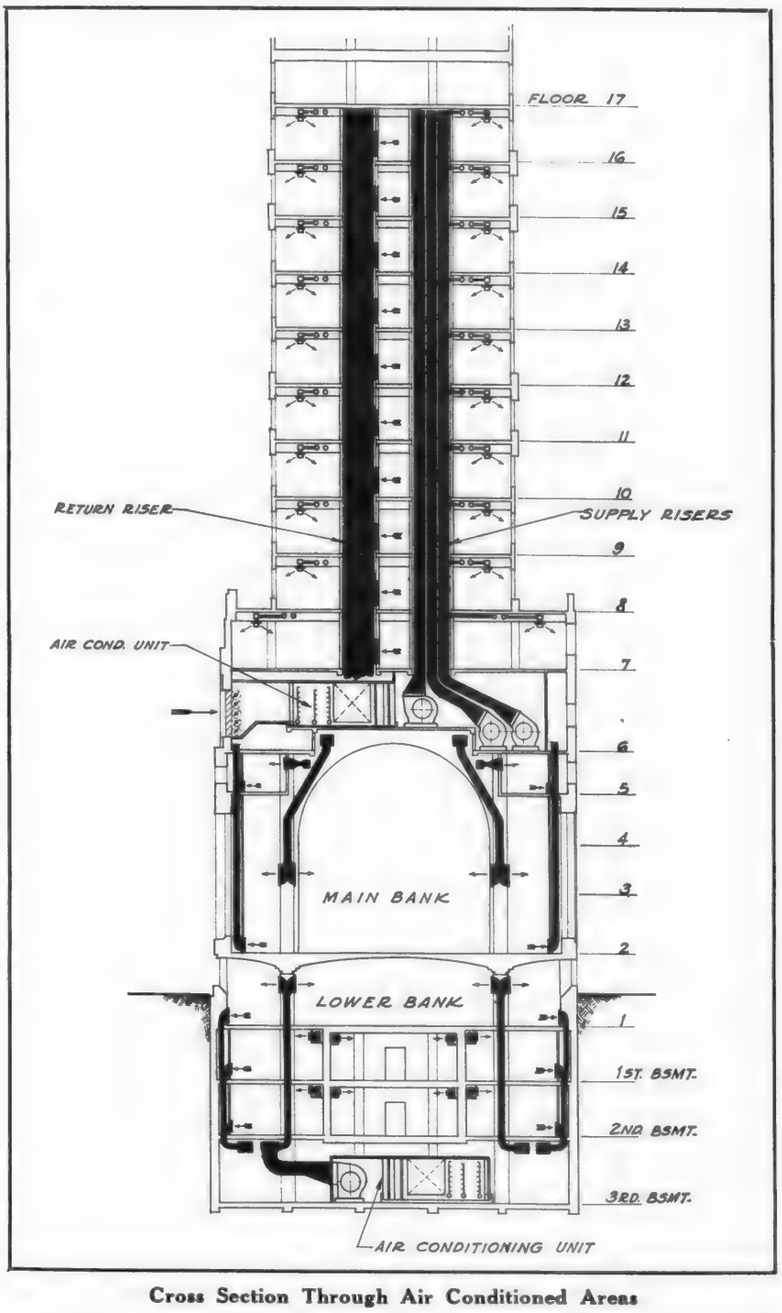


Arrangement of Ducts and Floor Construction

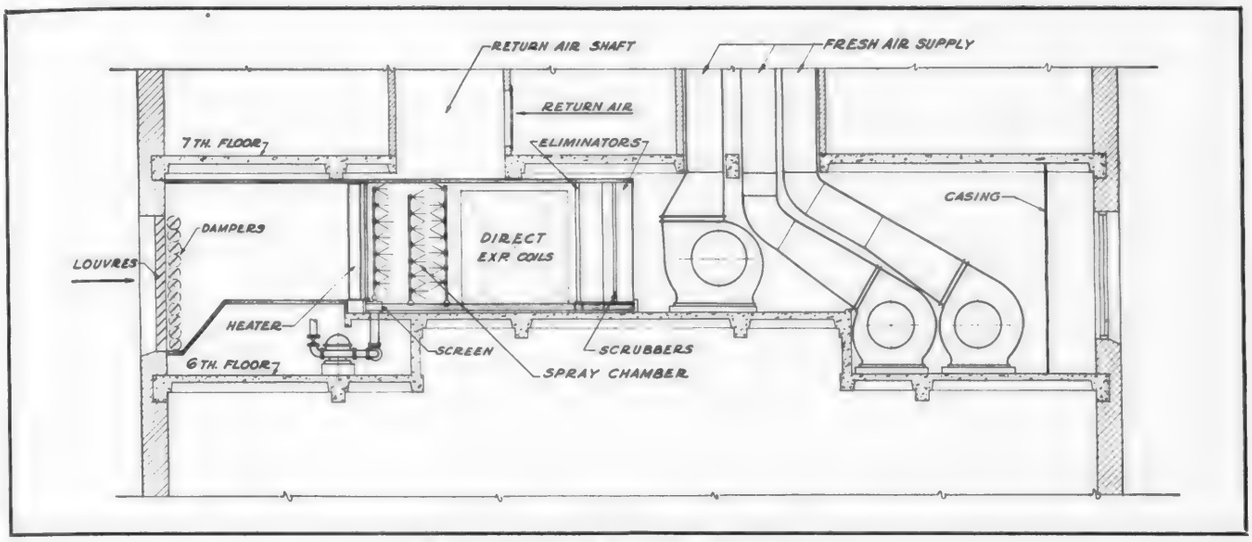
each floor could be kept within a maximum diameter of 12 in. where they crossed the floor beams. It was further found that structural considerations required these beams to be 22 in. in depth, and that if they were made 24 in. in depth and a joist floor construction used, that the 12 in. ducts could run through the web of the beams, effecting a very considerable saving in the cost of the structure over that which would have been required if the ducts had had to run under the beams. These distributing ducts terminate in a ceiling outlet, there being a double outlet for each bay, such that the usual office partitions can be run through the outlet if division of the office space at any time requires it. These outlets have a damper for adjustment of the air quantity and a simple diffusing head for directing the air flow along the ceiling. No provision is made for the occupant having any control whatever over the quantity of air supplied to his office or over its temperature.

The office system varies from the bank systems in the provisions for recirculation. There is no system of recirculating ducts other than the recirculating riser to the unit at each end of the building. There are recirculating grilles in the office partitions, located in general near the floor so that the air supplied to the office can in part find its way to the corridor and thence to the recirculating risers. Some sacrifice in office privacy has resulted from the installation of these grilles, but in general the owners have felt that they could well tolerate it for the simplification and saving that it effected. In some offices and departments where this loss of privacy was considered objectionable, double grilles have been provided with sound-proofing between them.

With the occupant of an office having no control over the quantity of air supplied or over its temperature, some other provision had to be made for room temperature control. By providing on each floor a sub-duct system for each exposure and providing that system with its own heater, it was expected that, if the system was once adjusted for a proportionate air supply to each office, and if this air was supplied at proper temperature to one office for maintaining the room temperature, it would be of proper temperature for the other offices on the same duct system. On this basis a thermostat has been installed in a typical office for the control of the heater on a duct system. The effect of variation in the air supply due to wind pres-



Cross Section Through Air Conditioned Areas



Section Through Air Conditioning Unit

sure building up a counter pressure on any portion of the space supplied, has been minimized by carrying a relatively high static pressure on the system. Provisions for adjusting for such a condition have been further made by driving the fans, there being a fan for each exposure as above described, with variable speed motors. The occupants are not only prevented from interfering with the operation of the system itself, by adjustment of the quantity and temperature of the air supplied, but they also are prevented from upsetting exposure and leakage conditions by opening windows. All windows on the office floors are provided with keyed locks and are locked closed.

The designers of this installation were greatly assisted in perfecting its arrangement and details by the engineers of the B. F. Reynolds Co. and American Carbonic Machinery Co., who made the installation, and by the engineers of other air conditioning companies who gave so freely of their time and experience during the stages of development. The designers also are not unappreciative of the opportunity that was given them by the progressiveness of the building owners.

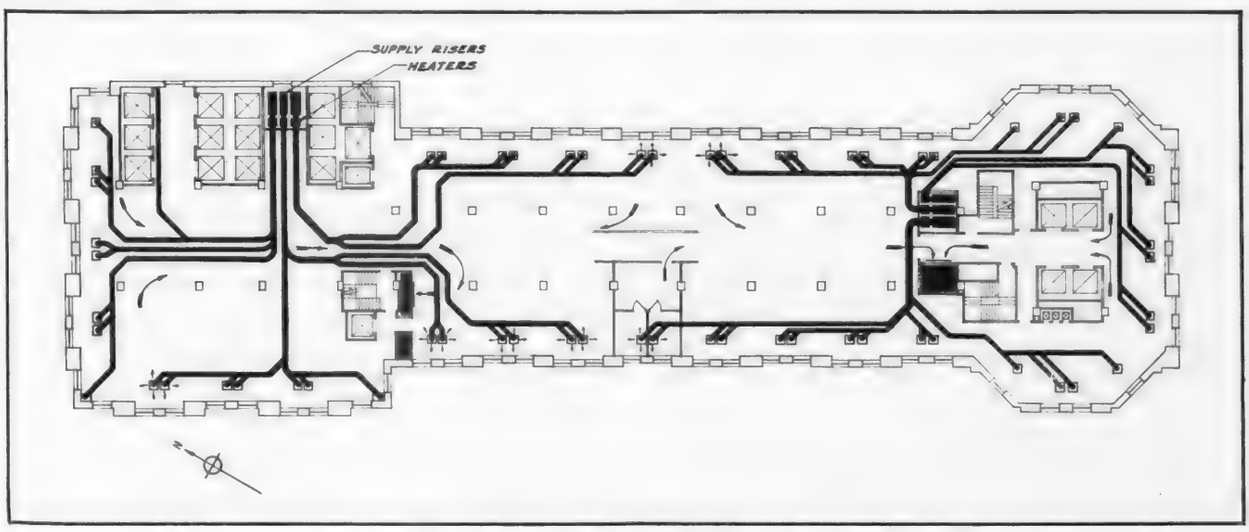
Research Papers Arouse Considerable Discussion

Some results of the cooperative research between the society and the University of Kentucky were reported in "Heat and Air Volume Output of Unit Heaters," by L. S. O'Bannon. This paper described a series of sixteen tests made on three unit heaters. The tests showed that the difference between the air volume outputs obtained by the use of the Pitot tube method and the condensate-temperature rise method is negligible.

"Determining the Quantity of Dust in Air by Impingement," by F. B. Rowley and John Beal, of the University of Minnesota, read at the session held June 28, contained the following conclusions:

First: That the amount of dust taken out of the air by the impingement method depends upon several variable factors. Among these factors are size and shape of nozzle, position of nozzle with reference to the collecting plate and velocity of air through nozzle.

Second: The determinations by such a method must necessarily be relative as it is impossible under any conditions to take all dust out of the air and count the same.



Arrangement of Ducts on Office Floors

Third: The size of dust particles in the air varies through a wide range, and it is evident that some minimum size must be selected below which it is not necessary to count the particles. This lower limit may be set with reference to the quality of the air desired.

Fourth: By holding the conditions constant under which the samples are taken, results may be obtained with the impingement type of counter which are reasonably consistent.

Fifth: There is nothing gained in accuracy by placing nozzles in series.

"Errors in the Measurement of the Temperature of Flue Gases" were discussed in a paper by P. Nicholls and W. E. Rice, both of the Bureau of Mines, Pittsburgh. Errors arise from a number of causes which can broadly be divided into: Errors due to inaccuracies of the thermometer or instruments used with it, errors due to the failure of the thermometer to indicate the true temperature of the gas stream in contact with it, and errors due to the fact that the temperature as measured may not represent the true average of the whole gas stream. The object of this paper was to describe and discuss the second class of errors. The tests reported showed that the use of an exposed thermocouple installed as specified in the boiler testing code of the society and with the flue insulated will indicate a temperature which will approach that of the true average temperature of the gases. The probable error should be within 10°.

It was suggested that a standardization of the position of the thermocouple for test purposes should be with its junction on the center-line of the flue. The best location would be at four equivalent flue diameters from the boiler because this would give time for the gases to mix. This might not always be convenient and it would be satisfactory to allow not less than two or more than four diameters. The size of the thermocouple wire should not be more than No. 20 B. & S. gauge (0.0319 in.).

"Capacity of Radiator Supply Branches For One and Two-Pipe Systems" was the title of a paper delivered by F. C. Houghten, M. E. O'Connell, and Carl Gutberlet, and devoted to a study of the capacity of pipes for the various parts of a heating system. Results obtained are those determined from investigation of the A.S.H. & V.E. Research Laboratory in cooperative study with the Heating and Ventilating Department of Carnegie Institute of Technology.

In conclusion, the authors stated that:

"1. The investigation gives the capacities of one and two-pipe radiator supply branches without audible sound as shown. These capacities, however, are only obtained when the pipe is well reamed and should be taken with a factor of safety for less perfect workmanship.

"2. A series of curves gives capacities after a factor of safety of 20% has been applied.

"3. Valves found on the market frequently have port openings smaller than pipe of the same nominal pipe size. Such valves limit the capacity of radiator branches below the capacity of the pipe itself for pitches above a certain value which are, however, greater than the pitches usually allowed.

"4. The capacity of a branch is greatly increased by an increase in pitch.

"5. There is a measurable difference between the capacities of branches 5 ft. and 10 ft. in length, which difference varies with the size of pipe and the pitch. The larger the pipe, the greater the difference in capacity with length. This difference also is more pronounced for small pitches."

At the Agricultural and Mechanical College of Texas, research work on water heating is being carried on under a cooperative agreement between the college and the American Society of Heating and Ventilating Engineers. This work is under the direction of F. E. Giesecke, director of the Engineering Experiment Station of the college, and he and Elmer G. Smith presented at the convention some of the results of their experiments in their paper "Pipe Sizes for Hot Water Heating Systems." Some of the results of this investigation will appear in HEATING AND VENTILATING for August.

A plea for a wider diffusion of knowledge relating to heating possibilities was made by James Govan, of Toronto, in his paper "Time Lag as a Factor in Heating Engineering Practice."

Mr. Govan's chief purpose in presenting his paper was to suggest an alternative definition of resistance as used in determining heat transmission coefficients. The secondary purpose was to call attention to the effect of the retention of heat in buildings having increased resistance to heat flow, when the calculations to determine the size of the heating plant are based on the recommendations presented in the *Guide*.

Paul D. Close, technical secretary of the society, read a paper on "Five Suggested Methods of Appraising Insulations." In his conclusions, Mr. Close stated that:

Midsummer Meeting of the American Society of Heating and Ventilating

"There is an apparent need for a method of appraising or evaluating insulations. To establish a fair and equitable basis for comparison, however, does not appear to be an easy matter. In order to encourage further thought on the subject, five plans are suggested. The first is based solely on conductivities per inch of thickness. The second is a resistance method taking into account the thickness in which the insulation is installed. The third plan is intended to rate insulations according to the extent to which they reduce the rate of heat transmission through a wall or roof, and, therefore, involves the type of construction, the thickness of insulation and the manner of installation. The fourth scheme would rate insulations according to the cost per unit of resistance, either for the material alone or on an installed basis. The last plan suggests the possibility of appraising insulations according to the return on the investment.

"It is evident that this subject is one which warrants further study for the purpose of rationalizing the rating and classification of insulations and eliminating quibbling over small, insignificant differences in the conductivities, which is so detrimental to the progress of the insulation industry."

Code of Minimum Requirements Issued

The Code of Minimum Requirements for the heating and ventilation of buildings has been issued in loose-leaf form by the society. The book is made up of 14 sections totaling 158 pages.

Each section was prepared by a subcommittee working under the general chairman, L. A. Harding. The men who assisted Mr. Harding were: E. V. Hill, A. C. Willard, R. V. Frost, L. C. Soule, J. F. McIntire, J. D. Hoffman, J. R. McColl, J. A. Donnelly, W. S. Timmis, C. A. Booth, W. H. Carrier, Perry West, F. Paul Anderson, and J. H. Walker.

Subjects covered in the code are:

Minimum ventilation requirements for public buildings.
Minimum requirements for estimating the heat required for warm buildings.
Minimum requirements for the determination of the amount of direct steam and hot water radiating surface to be installed in steam and hot water heating systems.
Minimum requirements for the determination of the amount of indirect steam or hot water heating surface to be installed in indirect gravity and fan circulation heating and ventilating systems.
Minimum capacity and installation requirements for low-pressure steam and hot water heating boilers.
Minimum requirements for the design and installation of warm-air furnace heating plants.
Minimum requirements for the design and installation of chimneys or stacks for steam boilers, hot water boilers and warm-air furnaces.
Minimum requirements for pipe sizes for use with low-pressure steam, vapor and vacuum heating systems.
Minimum requirements for pipe sizes for use with gravity and forced hot water heating systems.
Minimum requirements for the design and installation of air ducts, inlets and outlets, in conjunction with fan air circulation, and the installation of ventilating fans for use with steam and hot water heating and ventilating systems.
Minimum requirements for the installation of air washers and filters.
Pumps for heating and ventilating equipment.
Formulae for physical units, air and vapor mixtures, etc.
Standard symbols for heating and ventilating drawings.

Published by the American Society of Heating and Ventilating Engineers, 29 W. 39th St., New York.

Size 6 in. x 9 in. Pp. 158. Flexible cover. Price $5.

New Officers of Michigan Chapter

New officers of the Michigan Chapter were elected as follows, at a meeting held at the Hawthorne Valley Golf Club, Detroit, May 16, following a day's outing on the links:

President, William G. Boales; vice-president, E. E. Dubry; treasurer, R. K. Milward; secretary, E. H. Clark; board of governors, L. L. McConachie, W. J. Whelen, H. M. Stephen. Charles B. Haynes, vice-president and sales manager of the Hoffman Specialty Company was present at a guest of the chapter.

Kentucky Students Guests of Western New York Chapter

Over 175 members and guests, including the senior engineering class at the University of Kentucky, were present at the May meeting of the Western New York Chapter, held May 13, at the Elks Club, Buffalo. The evening was entirely a social one. President O. K. Dyer presided. Among the speakers were Dean F. Paul Anderson, W. H. Carrier. E. B. Langenberg and L. A. Harding.

Dean Anderson told of the ideals of Kentucky engineers and the value of the annual inspection trips, which the senior class takes through the industrial centers. He introduced other members of the faculty of the engineering school of the University of Kentucky, who accompanied the students. N. L. Nallau responded for the senior class. President Thornton Lewis, who is an alumnus of the University of Kentucky, also was present together with Secretary A. V. Hutchinson of the society.

New Zealand Forms Warm-Air Association

An association known as the National Warm-Air Heating Association of New Zealand was recently formed with B. H. Andrew, New Zealand Central Heating Company, as president; M. W. Marriage, Newberry Walker, Ltd., vice-president, and H. B. Alleway, New Zealand Central Heating Company, secretary-treasurer.

Mr. Andrew came 10,000 miles to attend the 1927 mid-year meeting of the National Warm-Air Heating Association at Urbana, Ill., and spent considerable time in this country at that time studying warm-air heating.

Engineers, at Bigwin Inn, Ontario, Canada, June 26-28, 1929

Lack of Profits Heating Contractors' Problem

Walter Klie

Re-elected President of the Heating and Piping Contractors National Association

Mr. Klie is president of the Smith & Oby Co., Cleveland, O. He is a past president of the National Building Trades Employers Association. He also has served the Heating and Piping Contractors National Association successively as a member of the board of directors, vice-president, and chairman of the board of directors.

RADICAL changes in conditions of business requiring new methods were declared to be one of the outstanding problems before the heating contractors and were given prominence in most of the addresses and reports at the fortieth annual convention of the Heating and Piping Contractors National Association, held in St. Louis, Mo., June 10-13.

As a direct result of these changes, the contractors, it was brought out, are not getting their share of the profits. The seriousness of the situation was realized when it was stated that the last few years have been the nation's largest building years, so that we have no basis for assuming that we are in a sub-normal condition as to volume.

Coupled with the failure of the contractor to secure adequate profits on his work was the problem of merchandising and, in this connection, the value of certified heating in building up the merchandising program was emphasized. The convention was one of the largest in the history of the association.

Mayor Victor J. Miller, of St. Louis, welcomed the delegates after the opening session had been called to order by President Walter Klie in the large ballroom of the New Jefferson Hotel, St. Louis, Monday afternoon, June 10. Jules E. Strong, president of the Heating and Piping Contractors St. Louis Association, acknowledged the mayor's greeting.

President Walter Klie, in his address, discussed very frankly the conditions facing the industry, giving first place to "lack of profits" as the outstanding ill from which the contractor is suffering. Following is his address substantially in full:

Leaders in every industry agree that conditions of business have been undergoing radical changes, and that serious study must be given to these changes, with the hope of arriving at conclusions which will give proper guidance to those engaged in these industries.

Let us review some of our most outstanding ills and the agencies available for their correction.

We can really sum them all up under one general head, namely, "Lack of profits," and consider all others as contributing factors.

I, personally, find little truth in the old adage of "Misery loves company," but I have observed that every business magazine, trade paper, association president's address, regardless of the industry referred to, is full of this same complaint with very similar contributing causes.

We have a great capacity to produce, with the resultant buyer's market, the multiplication of manufacturing, distributing and the installation facilities and the resultant sacrificing of profit to the hunger for volume.

This condition is bad for any industry, but particularly dangerous for the contracting business, where our costs are only estimated ones, and we consequently do not have the safeguard of definitely predetermined cost to protect us against unfair buying and weak-kneed selling.

Add to this condition the fact that many contractors are grown-up mechanics, with little or no business training, and you have a rather discouraging picture of a permanent buyer's market with men not properly trained in sound business methods and without definite predetermined costs, endeavoring to meet the situation successfully.

Many contractors are comforting themselves by the belief that we are in a particularly subnormal time as far as volume of business is concerned, and that if they can keep going for a time with low-priced work that business soon will pick up, and when the volume available becomes much larger, competition will be less and profitable contracts will just naturally come to them.

Unfortunately, there is no basis for this belief. The last few years have been the nation's largest building years and we have no sound basis on which to assume that we are in a sub-normal condition as to volume.

We must not lull ourselves into a feeling of security on this false premise, but must awaken sharply to the realization that we ourselves must solve our problems as they now exist and will continue to exist indefinitely, and not wait for some out-

side agency or some great economic change to automatically improve them.

Knowing costs accurately is, of course, fundamental to successful business, and in a market dominated by unfair buying and weak-kneed selling, it is an absolute necessity.

Major Items in Business Costs

Our cost is divided into three major items, namely, the material, productive labor and overhead.

While I believe that part of the cause for disappearing profit is because many are deliberately adding insufficient profit to their cost, I believe the main cause is inaccurate labor and material costs and either ignorance of or disregard for overhead, and the resultant gullibility of the contractor when a ruthless buyer tells him a real or imaginary figure of a competitor.

One of the first qualifications that any man should have, to entitle him to engage in the contracting business, is the ability to estimate accurately his labor and material cost and to ascertain his average overhead percentage and then the intestinal fortitude to back them up against all temptation.

The present condition in our business indicates conclusively that these qualifications are not sufficiently general. Consequently, we are driven towards finding additional safeguards.

One method which I frankly believe is full of possibilities, both good and bad, is the quantity survey. Joseph C. Fitts has dwelt at some length upon this method in his report, and has suggested that a special committee of our national association be appointed to analyze the work being done by several of our local associations along these lines, and if this committee finds the good features sufficiently outweigh the bad, to draw up their conclusion in a program that the national association might recommend to its local associations and membership.

I believe such a committee should be appointed, not as a blanket approval on the part of the national association of quantity survey, but for the purpose of research and study, and subsequent recommendation.

Mr. Fitts also has some very intelligent things to say in his report regarding the studying of overhead with its relationship towards size of contract and volume of business, and I believe either this same committee or a sub-committee should be given the task of studying this subject.

No greater service can be rendered our members, the public and the industry as a whole, than to assist in the finding of accurate cost and the building up of confidence in them.

If material and labor and overhead costs are properly figured and respected, I have confidence that the major step is taken toward securing profit.

These principles have been proclaimed in different ways, at many conventions and association meetings, all to some good purpose, but the difficult thing is to provide ways and means of their enforcement.

As a part of a group meeting, the contractor agrees that his competitor has definite material and labor costs and overhead, but when he gets back to the every-day details of his business, he only knows that he wants and perhaps needs the job he is figuring, and concludes that if he adds his proper overhead and a reasonable profit to a careful cost, he will not get the job.

Thus each competitor is blaming all other competitors for the condition that he himself is helping to create. A vicious cycle of trying to outguess our competitors in place of trying to find and improve upon our true cost.

There is, in my opinion, one sure method of forcing ourselves and our competitors to figure at least accurate labor and material costs and true overhead, or go out of business.

That method is the removal of the present artificial interference with economic laws, namely, the extension of unwarranted credit by material men to contractors.

Productive labor and overhead must be paid for regularly, even though the contractor refuses to recognize the fact that he has an overhead.

This leaves only one cushion, namely, the largest item, material, and if this has to be paid for under some reasonable but firm credit terms, the contractor who uses careless costs and ignores overhead, cannot endure.

As long as he can push his underestimated costs and his overhead into increasing accounts payable, he can continue to undermine his competitors by either making it impossible for them to secure business, or by causing them to lose confidence in their own costs, and finally meeting his prices and joining the class of "Slow-pay" and eventually "No-pay" contractors.

I have been dwelling on this simple and obvious remedy for our major ailments for a good many years, and I am convinced that the time is now ripe for real action.

The material men and jobbers are now sick enough of uncollectable accounts and the general contractors, bankers, chambers of commerce and the thinking public, also are realizing that every business man, regardless of his classification, who is conducting his business soundly, efficiently, and with integrity, is contributing to the welfare, prosperity and success of his community, and should be encouraged, and that every unsound, gambling type of business man is a menace and should be eliminated, even though expediency sometimes offers real temptation.

Someone has said, "If a man has a contagious disease, he is quarantined. If he brandishes a knife or a gun, he is locked up. If he steals, a warrant is sworn out for his arrest. Price cutters have been permitted to run rampant; in wrecking themselves, they have been permitted to wreck others."

There is room for great improvement in merchandising in our industry, and the contractors must do their full share in producing and creating more business from new sources, such as modernizing old homes and buildings, keeping our customers up to the styles, and generally selling more and better equipment on all jobs new and old. Our "Certified Heating" program assures adequate and better heating jobs.

Up to the present time I believe that the efforts of the industry toward more and better merchandising have been haphazard and incompletely planned. The manufacturers have been doing some splendid advertising. Here and there a manufacturer or a distributor starts some pet method of his own with a hope for a personal advantage. Contractors establish display rooms and try out the use of advertising and salesmen,

and when the results of all these hit-and-miss schemes are not satisfactory we think we have proven something.

In my opinion, the only thing we have proven is that the three branches of our industry, manufacturers, jobbers or distributors and contractors must work out *together* fundamental principles and methods that will insure hand-to-hand cooperation, with the interest and problems of all branches heard and considered and correlated.

To provide proper incentive to the contractors some method will have to be worked out whereby some amply adequate number of qualified contractors in a community will have sufficient advantage accrue directly to them to warrant them in making the necessary outlay of money and time to carry out a thorough and complete program of merchandising of such products in which they have such advantage.

Every industry that has been outstanding in successful merchandising has recognized this fact. Why does our industry continually ignore it and then blame the contractor for being a poor merchant?

Even in the grocery business, where the Louisville Grocery Survey has just been completed under the auspices of the Department of Commerce, after all the results of the survey had been analyzed and studied, this conclusion was reached: "All this plainly shows that the wholesaler must select his customers, confining his efforts to those who can make money for him and themselves."

The logical place for working out this merchandising problem *together* is the Plumbing and Heating Industries Bureau, under the very able leadership of Russell G. Creviston. Due to the increasing financial problems of the bureau itself it seems we have been gradually getting away from what I believe is the bureau's greatest function, namely, industry problems, not worked out by each branch separately and entirely from its own point of view, but jointly with the good of the entire industry as the guiding motive.

President Swanson, of the Central Supply Association, at their January meeting in Chicago, indicates that the thinking manufacturers and wholesalers fully realize this need. In his very able address, he contrasts the relationship between the manufacturers or distributors and dealers or merchants, in the radio, automobile, washing machine industries, with our industry and concludes that the contractor would become a satisfactory merchandiser if the relationship were properly developed, and further makes this statement which should quiet any apprehensions that we as contractors may feel, regarding the desire on the part of manufacturers and wholesalers to detour the contractor in sales to the public. "We should be unafraid to assert to the world that for the class of material we sell, and for the safety of the public we serve, our present method of distribution is the best that can be devised. Our method of distribution has not been a failure, but, on the contrary, has been a success and could be carried on to much greater success if all those connected with it work in closer cooperation and harmony."

The manufacturing and wholesale division of the Plumbing and Heating Industries Bureau had a Trade Practice Conference at Pittsburgh, Pa., on May 15, 1929, which I attended. Commissioner Charles H. March, of the Federal Trade Commission conducted the meeting. They adopted certain trade practice rules which I believe we should endorse.

Recommends Cooperation with Master Plumbers

Further, we should appoint a committee and invite the National Association of Master Plumbers to appoint a similar committee and these two committees should meet and work out rules for fair practice for our two industries with the intention of getting a conference with the Federal Trade Commission.

Every contractor should welcome the possibilities of such a supervised conference and the prestige and dignity that would be added to our conclusions.

Convention committees appointed at the opening session were: Auditing, Leonard G. Kirk, chairman; William W. Hubbard and Harry Geiser; credential, Harwell Allen, chairman; T. I. Magan, A. C. Banke, J. E. Strong and Merwin Porter; nominating, William J. Olvany, chairman; George M. Getschow, George P. Nachman, H. P. Materne and John H. Zink; committee on association improvement, publicity and relationship; J. E. McGinness, chairman; William G. Fraser, Thomas J. Connor, H. A. Netherton, Herbert A. Snow and George A. Schuster; Resolutions, J. P. Baldwin, chairman; Robert B. Miller, Curtiss N. Gilley, Justin A. Kiesling and Stewart A. Jellett.

Secretary Henry B. Gombers, who had returned from an extended sea trip in time to be present at the convention, was given a warm greeting as he was called to the platform by President Klie to let the delegates see, as Mr. Klie expressed it, how greatly Mr. Gombers had benefited during his leave of absence.

In the evening, a dinner for the "Old Guard," comprising the past presidents of the association, was followed by a "get-together" party at the New Jefferson Hotel.

Morning Session, Tuesday, June 11

The Tuesday morning session was taken up largely with committee reports and with two outstanding addresses, one by Russell G. Creviston, general manager of the Plumbing and Heating Industries Bureau, whose subject was "The Future of the Heating Industry," and another by Nicholas J. Biddle, general manager of the Allied Construction Industries, Inc., who presented "A Credit Plan for Construction."

Mr. Creviston painted a bright picture for the future of the heating industry, declaring that its evolution would be greatly accelerated by the recent developments in the design of heating and ventilating apparatus.

Mr. Biddle proposed an organization comprising all of the units in the building industry in any given locality. It should embrace, he said, all the factors in the chain of distribution and would have as its object the establishment of credit standards and the control of credit in a given section. In this way, he declared, the operations of irresponsible contractors could be eliminated by making it impossible for them to secure credit unless they were doing business on a profitable basis.

Such a control of credit has been

applied in the electrical field. In one case, said Mr. Biddle, the number of electrical contractors in a prominent city, was reduced almost one half, as the fly-by-night type were not able to meet the rigid conditions set down by the organization and were obliged to abandon the field. When a man finds it necessary to meet his bills promptly, pointed out Mr. Biddle, he sees to it that his estimate provides for a profit.

Report of Board of Directors

One of the principal recommendations of the board of directors was that "more money could wisely be spent along some of the lines represented by the activities of the Plumbing and Heating Industries Bureau, Research Laboratory of the American Society of Heating and Ventilating Engineers, Manufacturers Standardization Society of the Valve and Fittings Industry, American Standards Association, Allied Construction Industries Committee, and the Home Modernizing Bureau." The board also endorsed the proposed advertising of "certified heating" in architectural publications.

"If funds were available," continued the report, "it would be possible to get quick and yet sufficiently accurate information in regard to performance of new types of apparatus such as the new-pattern radiator. Such work at the present time is being done through the Research Committee of the American Society of Heating and Ventilating Engineers, . . . but some quicker, even if less thorough and less accurate, method should be adopted to serve temporary needs."

Commenting on the successful work of the Sub-Committee on Boiler Output, the report stated that the committee, "in finally working out for our members, a means of selecting cast-iron boilers suitable for their work, deserves special mention. Their work was much more than an engineering problem. It took diplomacy, patience, and courage to overcome the obstacles that fell in their way.

"The committee endeavored to give us tables based on data, from standard tests performed on every boiler, by, or for, the manufacturers, but after about two years of patient effort, this proved impossible.

"The tables we now have," continued the report, "establish a minimum standard for dependable work which very generally is recognized by the manufacturers as fair, without interfering with the selling of better and more liberal boilers on points of merit and economy."

A radical change, on which the report commented, is the fact that where local associations exist, membership in them is a requisite to membership in the national association. This, the report pointed out, is necessary for the carrying out of the Certified Heating program.

The report concluded with appreciative comments on the work of Secretary Henry B. Gombers, who was granted a leave of absence in April, on account of his health. He left early in April for an extended sea trip.

Secretary's Report

Emphasis was laid in this report on the importance of educating the heating contractor to operate so as to obtain a proper profit beyond his overhead to compensate for his investment and responsibility.

"Even a casual consideration of the conditions under which the members of our national association operate," stated the report, "shows some important problems pressing for solution. The volume of business in this industry is satisfactory. Last year the total contracts awarded as reported by the F. W. Dodge Company, for 36 states, was over $6,000,000,000. The heating and piping industry received its share of this great sum and yet on all sides we hear the complaint that the contractor, in the large majority of cases, went through 1928 without profits. Will they go through 1929 as well, without remedying this condition?"

The report went on to discuss the economic background.

"We are today involved in a buyer's market that is permanent in character, and the education of the public to appreciate and use the services of the heating and piping contractors must have the attention of the best minds of our industry, both the contracting element and those of our sources of supply. And those sources of supply are as vitally interested in this problem as we are, whether they know it or not, for unless the contractor prospers they themselves cannot possibly prosper.

"Closely related to this problem of profits is the problem of proper use of credits in our industry. Credit properly used means the advancement of the industry. Credit abused means ruin. Credit is one of the most sensitive parts of the business structure. How to limit its abuse without hampering legitimate development is one of the biggest problems before us today."

Discussing true costs, the report went on: "At the same time a study of the cost of doing business must be made—and to be really successful this study should include a consideration of ways and means for reducing this cost and eliminating from our industry all possible waste."

As was brought out in the report, "certified heating" has passed the experimental stage. Twenty-six local associations are now licensed to render this service, and use the identifying marks of the system. "Before the end of 1929," the report stated, "we hope to have national distribution—certified heating established in all cities of 100,000 or more in the United States.

"This is only possible, if the national association has the closest cooperation of every local organization in working with the unorganized groups in their own territory."

In conclusion, the report stated: "We have still the question of credit before us, and it should receive the careful attention of our convention. Credit is being loosely granted in our industry. The stable and responsible contractor finds himself facing the competition of the unstable and sometimes irresponsible contractor who is operating on the kindness of distributor's credit managers.

"No one has the full solution in his hand at present. It is a subject which must have earnest study, both on our part, and on the part of the distributor, so that some method may be found of returning credit to the position it once occupied, a criterion of a man's worth and standing in the industry, rather than a bludgeon to be wielded indiscriminately by the unthinking in a highly competitive field."

Report of Committee on Standardization

After discussing the difficulty of protecting association members from sub-standard products offered them, the report of the Committee on Standardization went on to say, "how best can we provide this protection? Undoubtedly, the surest way would be to establish our own testing laboratory, equip it with the necessary apparatus, instruments, etc., employ a trained technical staff, a competent executive, and give our members the truth about any piece of equipment that is offered for their use.

"Lest we be misunderstood we would not have you confuse this recommended laboratory, in any way, with the laboratory now being conducted by the American Society of Heating and Ventilating Engineers. Theirs is a research laboratory, and not a testing laboratory. Their function is to determine the fundamental laws relating to heating, ventilating, and air conditioning, and not the comparative capacities, or efficiencies, of various pieces of apparatus. Our association, through your committee, enjoys the closest cooperation with them and their laboratory on all matters of mutual interest.

"Failing the establishment of such a testing laboratory," continued the report, "what other means have we of protecting our members?

"There is a very well developed plan which we, in cooperation with the American Society of Heating and Ventilating Engineers, can put into active effect. Their society has developed several, and are working on other codes, so called, for testing various types of apparatus. If we, as users of this apparatus, insist that the manufacturers test their own equipment in accordance with these codes, and furnish us the data from their tests, as required by the codes, or state that their output capacities are determined under the terms of the code, we will find that similar equipment of various manufacturers can be readily compared. We will further find that output capacities so determined will be safe and reliable for our use."

Report of Sub-Committee on Boiler Output

That more progress occurred during the past year than all previous years, was brought out in the report of the Sub-Committee on Boiler Output. The report went on, "We have realized that the development of the standard test and performance charts, while being the first and most important step, would not give our members all that they required in their efforts toward standardization, in our industry.

"However," the report continued, "the fact that the American Society of Heating and Ventilating Engineers, as well as the National Boiler and Radiator Manufacturers Association, have adopted practically the same standard, is another source of satisfaction to your committee.

"The first step answers the problem in so far as the data to be given to the boiler manufacturers are concerned, and your committee is very hopeful that all boiler manufacturers will publish such charts on their full line of boilers. This, of course, will require considerable time and expense on the manufacturers' part and many of them seem to be slow in even getting started on the task. In the meantime our work on standardization could not stand still."

Then the report said, "Many of our local associations have adopted the Certified Heating plan and so it was necessary that a standard method of selecting a heating boiler be developed and adopted at once to work in with the Certified Heating plan.

"For these reasons the committee prepared and completed in July, 1928, recommendations for net radiation boiler loads and these charts were distributed as the first recommendations to our members."

Fortieth Annual Convention of the Heating and Piping Contractors National Association at the New Jefferson Hotel, St. Louis, Mo., June 10-13, 1929

It also was brought out that, "in November, 1928, the committee prepared and completed additions and revisions in net radiation boiler load charts, which again were distributed as recommendations to our members. Notwithstanding the detailed explanations given for selecting boilers from the charts for a given net radiation load, a great many questions were asked and many explanations had to be made, giving our members additional information, all of which required a great deal of time and correspondence.

"During this time," the report stated, "the chairman, George M. Getschow, was requested by the board of directors to attend a Secretaries' Conference at national headquarters and give them additional first-hand information in connection with our boiler charts, with the result that about twenty locals have adopted the same.

"There were many secretaries present and therefore numerous questions asked and answered, many suggestions were offered, and one of the most important was—why could not the Sub-Committee on Boiler Output prepare net radiation boiler load charts on the different boiler manufacturers' boilers, and if not, why should not the different locals do so, using the method of the national association in preparing their charts for their local use.

"The committee, in considering this question, concluded that many variations would probably take place by different locals acting independent of each other in attempting to interpret and apply the national method and prepare charts listing the kind and number of each manufacturer's boilers as catalogued and recommending a net radiation load.

"The committee, realizing the importance of this question, immediately made further inquiries from many members of our association and from as many of the large boiler manufacturers where it was reasonably convenient to secure a personal conference.

"It was quite apparent from these inquiries," stated the report, "that if the kind and number of each boiler manufactured and catalogued was to be charted with net radiation loads by applying the Sub-Committee on Boiler Output's method, these charts should be prepared by the National Association through its Sub-Committee on Boiler Output."

Yet difficulties came up, or as the report stated it, "the principal difficulty seemed to be in arriving at the proper grate dimension to use. As there did not seem to be any standard method for measuring grates, the committee adopted a standard method which we felt was fair to all boiler manufacturers. Then we actually measured all of the boilers on which recommended loads are given. These actual measurements are given in our published charts. In some cases you will notice that the diameter or width of grate given in our charts does not conform to those listed in the boiler manufacturer's catalog. This only emphasizes the importance of having a standard method of measuring a grate.

"About the first of April, 1929, the committee found in checking the data on hand, that they would be justified in issuing net radiation boiler load charts on different manufacturers' round and square cast-iron boilers.

"The work was completed during April on all the boilers on which we had been able to secure the required information and charts prepared, the result of which is in your hands."

It was also the opinion of the committee that "these charts, simple as they are, will be of great assistance to our members in their effort for standardization and particularly where Certified Heating is used as a means to promote standard heating installations.

"It is not claimed by the committee that all boilers, if selected from these charts, would give exactly the same performance under the same operating conditions. Some judgment by the contractor must and always will have to be used in his selection. We do claim, however, that any of the boilers listed will carry the recommended loads. One type or make of boiler would probably carry the same load with greater over-all efficiency or with less attention than some other type. This, of course, is a selling argument for that particular manufacturer, but he would have to prove his argument by submitting a complete performance chart of some other make of boiler."

Regarding chimneys, the report stated: "The chimney requirement for one make of boiler might be unsuitable for the chimney available. Here let us emphasize the importance of giving proper consideration to the chimney. If you are unable to get the proper chimney size for the boiler you would like to use, never hesitate to switch to some other boiler, and in no case assume the guarantee on a job when the owner will not provide the chimney recommended for the boiler you are going to install.

"The net boiler load charts are quite complete as to round and square cast-iron boilers, but at this time do not include steel boilers or boilers of special design which may be termed non-competitive type, and it is recommended that the incoming committee continue with this part of the work as rapidly as possible with the view of giving our members recommended loads on these types of boilers at an early date."

In conclusion, the report expressed sincere appreciation of help extended by the National Boiler and Radiator Manufacturers Association and others in the industry.

Report of Sub-Committee on Depreciation

In the report of the Sub-Committee (of the Committee on Standardization) suggestions were offered for figuring rates of depreciation of heating equipment, as reported in THE HEATING AND VENTILATING MAGAZINE for May, 1929. The table on Page 88 shows depreciation by years and percentages.

Report of Sub-Committee on Welding

The first work undertaken by this committee after its formation, the report brought out, was a careful survey of the entire heating industry in regard to welding practices.

It said, "this survey very definitely disclosed inadequate materials, no defined engineering standards, lack of procedure control, and a very evident misunderstanding of its real value through proper application."

The committee approved both the oxy-acetylene and the electric arc welding methods as applied to piping. Quoting the report: "All of our de-

RATES OF DEPRECIATION FOR NEW ASSETS

ITEMS	Depreciation Rates Recommended Years	Per Cent
Buildings and Building Equipment:		
fireproof	50	2
fire-resistant	33-1/3	3
frame	25	4
pipe sheds	6	16
sprinkler, heating, lighting	20	5
shop fixtures	10	10
Fixed Machinery—includes threading machines, forges, pipe benders, presses drills, and other shop equipment of this character.	10	10
Large Tools, Movable—include chain tongs, all sizes, work benches, vises, all sizes, power drives, cutters—above 2 in. sledge hammers, ladders, blocks and falls, bolt stocks and dies, welding equipment, tool chests, shanties, crow and lining bars, and other tools and equipment of this character.	3	33-1/3
Kit Tools—Road Tools—Small Tools and Hand Tools—include wrenches—Trimos, S, monkey, etc., spud, sprocket, small stocks and dies—2 in. and under, hammers, chisels, screw drivers, brace and bits, saws, breast drills, reamers, taps, hack saws, oil cans, pipe cutters—2 in. and under, trowels, plumb bobs, star drills, twist drills, levels, files, squares, dividers, and tools and equipment of this character.	1 yr. or less	100
Office Fixtures:		
mechanical office appliances (safe, typewriters, calculating machines)	5	20
furniture and fixtures (desks, chairs, draughting tables, filing cabinets)	15	6-2/3
Automotive Equipment:		
light	3	33-1/3
medium	4	25
heavy	5	20

velopment work and design of materials are intended to be applicable to either method in an economical manner."

In regard to the study and development of materials especially adapted to welding application, the committee reported that "we have encouraged the manufacture of a satisfactory welding elbow now available to our members. It is our desire to have the 45° 'V' type weld, with 1/16-in. offset, accepted as standard, and we will prepare and have accepted a definite welding rod requirement, thus stabilizing the use of these items."

Standard Welding Neck-Flange

"We believe our most important accomplishment so far," the report continued, "has been the design of a standard welding neck-flange. It is now a national standard, being manufactured on a competitive basis, and satisfactorily used by our members. The welding flanges heretofore offered us have been either unsatisfactory in design, or offered at a prohibitive cost, and our standard welding neck-flange successfully overcomes both these objections."

The committee also reported that a comprehensive manual on welding is being prepared by the Plumbing and Heating Industries Bureau in cooperation with the committee. The preparation of this manual, the report states, is due to the fact that other methods of publishing the immense amount of material on all phases of welding, as it affects the industry, would be unsatisfactory. The manual will be completed this year, it is expected.

"The Sub-Committee on Welding," the report continued, "will have as one of its objectives during the coming year, the promotion of the use of standard specifications by consulting engineers and architects, and the further development of additional materials, especially suited for use in welded piping installations. This work already has been undertaken and includes materials such as expansion joints being furnished us, with welding stems, instead of flanges."

In conclusion, the report stated, "we also have aided in the development of special apparatus, to prepare materials properly for a welding installation, and conveniently to test same during and after installation. As an evidence of this work, there is available . . . a pipe-beveling machine for beveling short lengths of pipe in the field and a test plug for closing the open ends of pipe without distortion."

Report of Committee on Trade Relations

George Mehring, chairman, reported that all items that had been referred to the committee on trade relations, had been disposed of, except the matter of a joint meeting with a committee of the American Institute of Architects, in reference to the elimination of the word "equivalent" from specifications. A resolution to this effect adopted by the Secretaries' Conference last year read:

"Resolved further, That the board be informed that in the opinion of the secretaries, the use of the word 'equivalent' tends toward the introduction of controversies and individual practices not conducive to the cooperation of the membership in local organizations.

"Resolved further, That the board be advised that it is the opinion of the secretaries that steps be taken to impress upon those who specify material that there should be one type of equipment or one make of equipment specified base, and that alternates shall be provided for the privilege of quoting upon additional makes, showing deductions or additions for so doing. In the belief of the secretaries, this would tend toward the elimination of the evil practice of specification breaking and would permit contractors quoting on installation entering the job on the same basis."

Upon the adjournment of the session the delegates were taken on a sight-seeing trip through St. Louis, during which a stop was made in Forest Park to permit an inspection of the Lindbergh trophies, which were on display. In the evening the party saw "The Student Prince" at the Municipal Open Air Theatre.

Morning Session, Wednesday June 12

An important action taken at the Wednesday morning session was the adoption of a new set of by-laws providing for an increase in dues and for an initiation fee, with a view of providing additional funds for the expansion of the association's activities, particularly the certified heating movement.

Committee reports presented at this session included those on membership and certified heating.

Report of Membership Committee

For the membership committee, E. W. Verity, chairman, reported that the goal set by the association at the beginning of the year had been reached by a hard drive. The association, it was reported, now has over 1000 members throughout the United States.

"In fact," stated Mr. Verity, "the association has added more new members this last year than any year for the past fifteen years. The State of California leads in the number of new members, with the State of Wisconsin second, and the State of Tennessee third.

"The central part of the United States, from the western line of Pennsylvania to the Rocky Mountains, has the greatest number of members, with the eastern states, taken from the eastern line of Ohio to seaboard, as second, and the western parts, or states west of the Rocky Mountains, as third in the number of members."

"Field work for 1929," continued the report, "is in the direction of organizing the forty-two cities of population ranging in size from 100,000 to 500,000 in which no local organizations now exist, although we have individual members represented. We also are working on other cities of less population which are just as important as the others."

In conclusion, the report stated that "the foundation already is established in several of these cities for this work. Through the organization work thus carried out, there is every reason to command the attention of the manufacturers for the sale of their products, and to have them correctly installed through this membership."

Report of Committee on Certified Heating

Thorough revision of its program for setting up local Certified Heating organizations was reported by the Committee on Certified Heating. As the report said, "We have stressed the necessity of a soundly-planned and financed program, to be administered by an association manager of unquestioned ability. Certified Heating will succeed in any locality where thorough cooperation is given it by the local organization."

Direct mail was stated to be a valuable asset.

"The committee," it was stated, "has made the booklet 'How Shall We Heat It?' available to local associations, regardless of whether or not National Direct Mail Campaign is purchased. However, the use of the entire campaign is recommended.

"National advertising," continued the report, "in architectural publications, has been studied and ways of financing have been considered. Considerable thought must be given to these questions. Should a portion of the cost of this advertising be prorated among the locals doing Certified Heating, the question arises, as to whether the amount assessed each local would not benefit them more if spent locally in advertising to the architects of that vicinity.

"However, the committee feels that national distribution of Certified Heating will be facilitated if national advertising of such a nature is done. Locals which start Certified Heating, where architects and others are already familiar with the plan through reading their professional publications, should have easy sailing."

Field Secretaries Obtain Results for State Associations

William J. Olvany, president of the New York State Association, told of the advantages secured through the employment of a paid field secretary in extending the influence and membership of the organization. President Klie mentioned similar results secured in Wisconsin, where the State association employs a field man. H. M. Hart also endorsed the employment of a full-time secretary, declaring that the expense was more than warranted by the results obtained.

An appeal to the members to interest themselves to a greater extent in the field of air conditioning was expressed by Walter L. Fleisher, who presented a paper on "Humidity in the Home," in which he discussed the fundamentals of air conditioning.

"Pipe Welding in the Heating Industry" was the subject of an inspiring address delivered by John H. Zink, chairman of the sub-committee on welding. Mr. Zink told of his own experiences in the development of welding as an integral part of his business, and accompanied his remarks with appropriate slides.

He referred to the accomplishment of his committee during the past year in the development of the new welding neck flange accepted as standard and now in competitive production, the design of a satisfactory test plug, a new beveling machine to bevel short lengths of pipe in the field, and the assistance given manufacturers of welding fittings and apparatus. His committee will recommend as standard the "V" type weld with spacing 1/16 in. to provide for proper fusion, penetration and expansion, and the necessity of going over each weld a second time with a reduced or heating flame to spread the retained heat in the weld proper into the pipe wall and thus prevent excessive contraction and resulting misalignment through cooling to normal temperature. They will recommend a controlled welding rod, recommendation as to goggles, apparatus, procedure control, a typical form of specification to control properly the application of welding, and said they appreciated the necessity of publishing these data in manual form for convenient study and that this manual now is being prepared.

He also was opposed to the welding school, at least in his locality, because the instructors in most instances were not experienced pipe welders. It is his belief that pipe welding is a special art, to be performed by artisans, and supported by a fundamental knowledge on the part of the contractor of the basic principles involved. He stressed the contractor's knowledge as all-important, first, to enable him to determine his own costs, sell quality and assist in economical design, place proper materials and apparatus in the hands of his mechanics, properly supervise, and thus disqualify the unfair asser-

tion that a weld is only as good as the mechanic who makes it.

Mr. Zink also stated that his committee has approved both the electric arc and oxy-acetylene processes, and favored the oxy-acetylene process for all beginners, and he felt that the initial investment necessary for the electric arc process would probably limit its use in the heating industry.

He said it was just as economical to weld wrought iron pipe as steel pipe, that he did not favor turning the pipe except as a matter of convenience and that his welders were qualified position operators, and further stated that welding was not as yet ready to enter the house-heating field in a competitive way.

Mr. Zink spoke strongly against selling a welded installation because it is cheaper, pointing out that each job took its own cost, and when offered in substitution for a flanged and screw fitting installation, is not always cheaper, and even when it is, the economy is not reflected in dollars and cents as a credit. The real economy of any welding installation is in its original design, and this control must of necessity be in the designing engineer's office. Mr. Zink stated that in many instances where welding was sold because it was cheaper, the results did not prove the assertion, so that "cheapness" is a poor selling argument and unnecessary in most instances.

He pointed out that about 95% of his installation work was by the welding process, and felt sure that the contemplated changes in our materials, design and service requirements would make welding a necessity so that the demand would compel the progressive heating contractor to adopt it for general use.

For the Committee on Certified Heating, A. R. Thompson, chairman, stated that the movement had experienced a 100% growth during the past year. It is the committee's intention now to send out letters to the associations operating on the certified heating plan to find out if they will support a campaign such as the committee is planning to advertise certified heating on a national scale.

A ladies' bridge luncheon at the Hotel Chase and an afternoon of golf for the men was followed in the evening by a dinner dance in the gold room of the hotel.

Morning Session, Thursday, June 13

At the concluding session, Thursday morning, William E. Taylor, executive secretary of the Heating and Piping Contractors New York City Association, spoke on "The Secrataries' Conference, Its Purpose and Scope." He was followed by Thomas T. Douglas, manager of the Heating and Piping Contractors San Francisco Association, who told of the operation of certified heating on the Western Coast.

"Advertising and Merchandising From the Standpoint of the Association Manager," was presented by B. Y. Kinzey, manager of the Heating and Piping Contractors Cleveland Association, while E. L. Flentje, of the market research division of the Plumbing and Heating Industries Bureau, talked on "Market Research Applied to the Heating Industry."

The association went on record as endorsing the steam heating boiler testing code of the National Boiler and Radiator Manufacturers Association, as revised January 1929, "it being understood that all of the members of the National Boiler and Radiator Manufacturers Association will have their boilers tested under this code by competent engineers and will furnish our Committee on Standards with complete performance charts showing the results of such tests. The association also approved the participation of its representatives in the deliberations of the Allied Construction Industry Committee, as well as the object for which that committee was formed.

The association referred the question of quantity survey bureaus to the Committee on Standards for investigation and study. Another resolution provided for the appointment by the association of a committee to meet with a similar committee appointed by the National Association of Master Plumbers "for the purpose of carrying out a joint discussion of the contractor's problems, leading to the formulation of a series of rules for the correction of such abuses as the joint committee may find."

The association, in a formal resolution, endorsed the simplified 13-month calendar, which is being proposed for universal adoption.

Officers of the association elected at the concluding session are:

President, Walter Klie, Cleveland, O. Vice-president, Frank W. Howard, Boston, Mass. Treasurer, Robert D. Williams, New York. Secretary, Henry B. Gombers, New York. Assistant secretary, Joseph C. Fitts, New York. Field representative, Edward G. Byrd, New York.

Board of directors: Walter Klie, chairman, William M. Anderson, Philadelphia, Pa. R. Carter Beverley, Richmond Va. J. Lawrence De Neille, St. Louis, Mo. Curtiss N. Gilley, San Francisco, Calif. Harry M. Hart, Chicago, Ill. Frank W. Howard, Boston, Mass. Horace W. Jones, Rochester, N. Y. John S. Jung, Milwaukee, Wis. Justin A. Kiesling, Houston, Tex. Ray L. Spitzley, Detroit, Mich. Robert D. Williams, New York.

Convention of N. A. M. P. in Buffalo

The 47th annual convention of the National Association of Master Plumbers was held at the Buffalo Auditorium, Buffalo, June 24-28. Among the exhibitors of heating apparatus were:

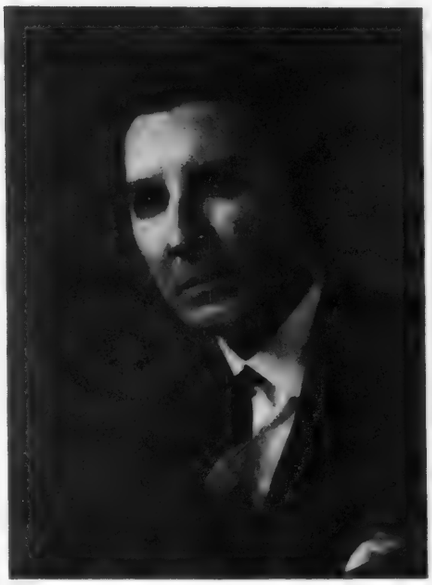
Abingdon Sanitary Mfg. Co., Abingdon, Ill.
Air Reduction Sales Co., New York.
American Blower Co., Detroit, Mich.
American Brass Co., Waterbury, Conn.
American Radiator Co. and Subsidiaries, New York.
Arco Metal Pipe Co., Cleveland, O.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Bell & Gossett Co., Chicago.
Black & Decker Mfg. Co., Towson, Md.
Blake Specialty Co., Rock Island, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Byers Co., A. M., Pittsburgh, Pa.
Central Foundry Co., New York.
Central Tube Co., Pittsburgh, Pa.
Chicago Pump Co., Chicago.
Cleveland Gas Burner & Appliance Co., Cleveland, O.
Clow & Sons, James B., Chicago.
Crane Co., Chicago.
Crystal Oil Burner Co., New York.
D. & T. Mfg. Co., Chicago.
Duriron Co., Inc., Dayton, O.
Detroit Lubricator Co., Detroit, Mich.
Ever Hot Heater Sales Co., Detroit.
Excelso Specialty Co., Buffalo, N. Y.
Frank Heater & Engrg. Co., O. E., Buffalo.
Hoffman Specialty Co., Inc., Waterbury, Conn.
Hotstream Heater Co., Cleveland.
Humphrey Co., Kalamazoo, Mich
Jenkins Bros., New York.
Johns-Manville Corp., New York.
Kewanee Boiler Co., Kewanee, Ill.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Mueller Co., Decatur, Ill.
National Tube Co., Pittsburgh, Pa.
Nye Tool & Machine Works, Chicago.
Radiator Specialty Co., Charlotte, N. C.
Reading Iron Co., Reading, Pa.
Roberts Gas Burner Corp., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa.
Standard Sanitary Mfg. Co., Pittsburgh, Pa.
Taber Pump Co., Buffalo.
Taco Heaters, Inc., New York.
Toledo Pipe Threading Machine Co., Toledo, O.
United States Radiator Corp., Detroit, Mich.
Walworth Co., Boston, Mass.
Weil-McLain Co., Chicago.
"X" Laboratories, New York.

N. D. H. A. Convention Reports Growth of District Heating

JUDGING from reports presented at the annual convention of the National District Heating Association, held in Detroit, June 11-14, district heating not only is advancing but more steam is being obtained per pound of coal burned, and the total output of the stations has been increased.

The report of the Committee on Operating Statistics, for instance, showed that the total number of customers of the companies reporting has grown from 12,968 in 1927, to 14,257 in 1928, an increase of 10%. Making allowance for the fact that the number of companies reporting this year was somewhat larger than the number last year, an appreciable gain is indicated. The total amount of steam sold, in thousands of pounds, increased from 21,962,425 in 1927, to 29,147,179 in 1928, a gain of 33%. Average steam sold per customer, in thousands of pounds, increased from 1710 to 1780. Higher operating efficiency of plants is reflected in the report that the pounds of steam sold per ton of coal burned has increased from 12,550 in 1927, to 13,100 in 1928.

As in previous years, the report contains a summary of the heating system in days and average temperature. It would seem that the use of the degree-day method by this association would enable reports to be presented on a basis which would make comparisons possible. The American Gas Association, for example, uses the degree-day as the basis for all house-heating calculations. The adoption of the degree-day unit by all organizations would greatly simplify calculations which, under the present system used by the association, makes a comparison of steam consumption in different cities dependent on climate. The degree-day unit itself takes care of the variable temperatures, so that the results are independent of outdoor temperatures.



J. C. Butler

Newly-Elected President of the National District Heating Association

Commercial engineer, Illinois Maintenance Co., Chicago, who this month completes 15 years of service with that company. Mr. Butler was graduated from the College of Electrical Engineering, University of Illinois, in 1914. Member of Western Society of Engineers, Sigma Tau and Eta Kappa Nu. Has been active in the N.D.H.A. for 10 years; chairman of Meter Committee, 1922-23; chairman, Operating Statistics Committee from 1924 to 1929.

Attendance and interest in the convention reached a new record this year, 195 having registered up to Thursday noon. Business sessions were well attended and the papers and addresses were excellently prepared. All of the reports were detailed and specific in their information and were marked by the absence of generalization.

Several features stood out as especially noteworthy, among them being the remarkable efficiency, courtesy and thoughtfulness exhibited by the Detroit Edison Company and its employes who were in charge of the entertainment and trips. Visits to the Ford River Rouge plant, the Ford airport, Belle Isle, Pewabic Pottery, a boat ride to St. Clair Lake, and inspection trips to the plants of the Detroit Edison Company were arranged so that all of the visitors were well entertained during the time between sessions.

At the morning session, June 11, the convention was welcomed to the city by A. C. Marshall, vice-president and general manager of the Detroit Edison Company, and the response was made by D. L. Gaskill, secretary of the association.

In his allocution, "Advance of the Industry and Predictions for the Future," John W. Meyer, president of the association, stated that:

"The years of 1928 and 1929 will go down in history as years of significant importance in our industry. Among the developments of particular interest was the Deep Water Generating Station, now in course of erection, located on the east shore of the Delaware River approximately 30 miles below Philadelphia.

"The plant has an ultimate capacity of 400,000 K.W., the initial installation involving three units, two of 53,000 K.W. each and one of 12,500 K.W. The 12,500 K.W. unit is designed for 1200 lb. steam exhausting 530,000 lbs. of steam per hr. at full load, passed to evaporators which will deliver 400,000 lb. of vapor per hr. at 180 lb. pressure. This steam is then super-heated to 440° total steam temperature by live steam super-heaters taking steam at 1200 lb. and delivered to the DuPont Company for process work.

"The DuPont Company also receives all the electrical energy generated by the 12,500 K.W. turbine, the basis of charge for both classes of service furnished the DuPont Company being through the billing of steam generation costs, proportional fixed and operating costs, ad-

justed for equity. This development marks the beginning of a change in the economic relations between utilities and those industries requiring large volumes of process steam.

"Announcement of the purchase of the Terminal Freezing and Heating Company by the Consolidated Gas, Electric Light and Power Company, of Baltimore, added to the list of heating companies another prominent utility.

"This company broke ground August 22 for the new terminal from which it began to deliver steam December 22, exactly four months from the date of beginning construction. The capital expenditures for betterments to the plant and distribution system and for property acquired during the year were $1,714,000.

"A franchise was granted the Philadelphia Steam Company in May of this year permitting it to lay mains in an extensive and rapidly growing commercial area of Philadelphia adjacent to that of the Philadelphia Electric Company. The area includes approximately 400 city blocks having a potential demand, consumption and revenue equal to the present business of the New York Steam Corporation. Under the terms of the ordinances, construction must start within 12 months and the company must begin business within 2½ years of the date of the ordinance.

"As a measure of growth I have taken the data of 8 companies whose reports are complete over several years. These companies reported sales of 15,662,098,000 lbs. of steam sold during 1927, and 18,015,502,000 lbs. during 1928, an increase of 14.1%. These same companies reported a total of 5992 customers for 1927, and 7587 for 1928, an increase of 26.6%."

Mr. Meyer further pointed out that, for the companies mentioned, the increase in pounds of steam sold increased 14.1%, while the ratio of steam generated per unit of fuel burned had increased 1.15%.

Alex Dow Elected Honorary Member

Following the report of the Executive Committee, a resolution was passed that Alex Dow, president of the Detroit Edison Company, be elected to honorary membership in the association. Mr. Dow is the third man to be so honored.

J. H. Walker, chairman of the Educational Committee, in presenting his report, referred to the district heating school which was conducted at Purdue University in May. The attendance at these annual schools at Purdue has been so large that it is felt that most of the personnel of the various companies has already attended, so that the school will be discontinued for at least one year. High tribute was paid to Prof. C. H. B. Hotchkiss who was in charge of the school.

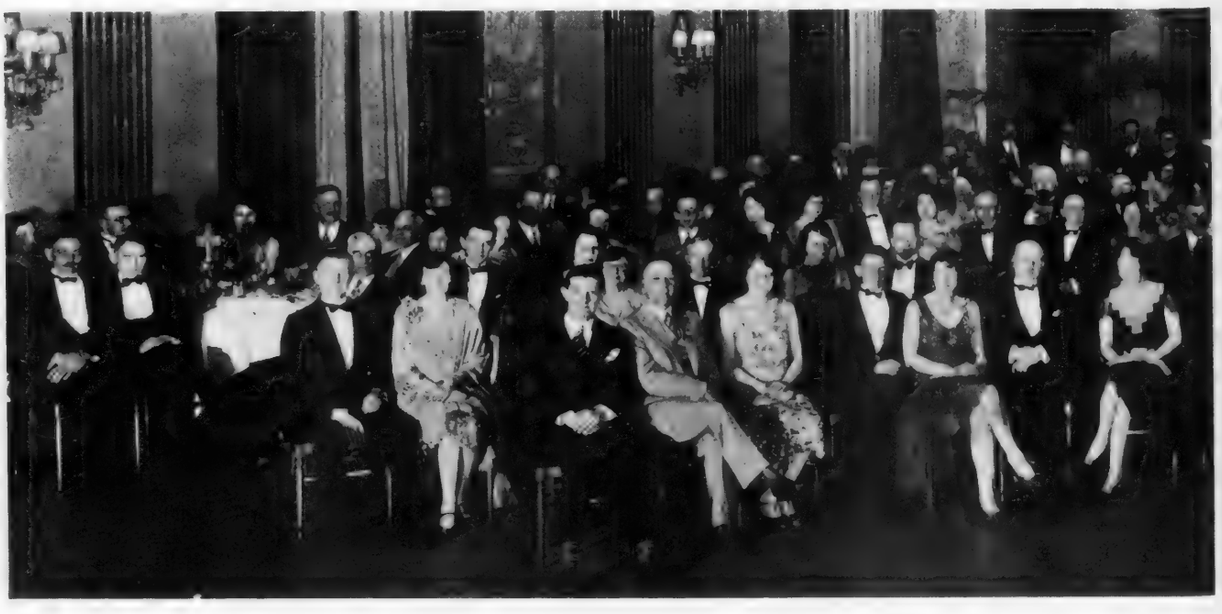
Professor Hotchkiss, who was present at the meeting, was then asked to make a few remarks. He responded by praising the papers and reports presented at the convention.

One of the outstanding addresses at the convention was delivered by C. F. Hirshfeld, chief of research, The Detroit Edison Company, his subject being "Modern Industry, Its Development and Significance." Mr. Hirshfeld stated that future historians may call this the age of mensuration, that today industry carefully measures whatever it is concerned with, and that some of the greatest of modern activities are those dealing with the measurement, in various units, of commodities, quantities, moneys, power, etc.

One of the points brought out in the report of the Committee on Operating Statistics was that the use of very high boiler pressures has not as yet invaded the district steam field. Last year the highest pressure reported was 375 lbs., and this figure remains unchanged for 1928. However, the number of companies with pressures in excess of 200 lbs. has increased from 7 to 11.

Sabin Crocker, The Detroit Edison Company, read a report on "National Piping Standards and Codes Affecting District Heating."

Mr. Crocker told how, since the organization of the American Engineering Standards Committee (now the American Standards Association)



Annual Banquet of the National District Heating

in 1918, and the sectional committee on pipe flanges and fittings in 1921, rapid strides have been made in standardization. The first standard agreed on, in 1886 before the organization of the committee was the Briggs standard for pipe thread. In 1894, the A.S.M.E., in cooperation with the National Assocation of Steam and Hot Water Fitters (now the Heating and Piping Contractors National Association) adopted a standard flange template. In 1912, standards were adopted covering dimensions and weights for cast-iron fittings.

He further said that "the sectional committee on pipe flanges and fittings has been one of the most active committees operating under the A.S.A. procedure. The sectional committee has published, or has in course of preparation, American Standards covering the following items: Cast-iron flanges and flanged fittings for 25, 125 and 250 lbs. working steam pressure; cast-iron screwed fittings for 125 and 250 lb. working steam pressure; malleable iron screwed fittings for 150 lb. working steam pressure; steel flanges and flanged fittings for 150, 250, 400, 600, 900 and 1350 lbs. working steam pressure, etc. In addition to formulating these dimensional standards, it has cooperated with the A.S.T.M. in the preparation of material specifications for these products.

"In 1926, the National District Heating Association was invited to participate actively in the work of the sectional committee on code for pressure piping, which was organized at that time. To this committee was assigned the task of drafting a code for all types of pressure piping which would be similar in scope to the A.S.M.E. boiler construction code. The need for this code became evident when the State of Ohio set out to draft a code of its own. It was sensed by various manufacturers and users of piping material that other states soon would follow suit, and that much hardship would ensue unless a national code was drafted which could be adopted by all states so disposed.

"At the request of the National District Heating Association an additional sub-committee has been appointed to formulate a section on district heating piping, which will include both steam and hot water distributing systems operating at pressures in excess of 15 lb. gauge."

The National District Heating Association also is directly participating in the work of the A.S.A. sectional committee on standardization of wrought iron and wrought steel pipe and tubing. This committee was organized in 1928, and now is actively engaged in an effort to simplify and standardize the manufacture and use of pipe.

"Recent Developments in Heating and Ventilating Practice" were discussed by Prof. A. C. Willard, of the University of Illinois. Professor Willard confined his address to an explanation of the test work and results obtained at the University of Illinois on radiator shields and enclosures. Slides were used to illustrate the points emphasized, special attention being given to "heating effect" as distinguished from the measurement of radiator capacity by condensation alone.

At the evening session, June 11, the Commercial Relations Committee presented its report. This committee formerly was known as the Heat Utilization Committee. Under the heading of "Customer Relations," the statement was made that "if the service is first class in every particular, it is sad but true that customers often will forget that they are benefiting through this happy state of affairs, due to the foresight and service of the district steam company. Appreciation must be cultivated in such cases. In this case the company must advertise its service through newspaper publicity, talks at local clubs, direct-mail advertising, oral and private conferences, whenever opportunity presents itself."

Instructions were given for the guidance of all of the different classes of employes with regard to their part in building up cordial relations between the customer and the company. These instructions included suggestions to every employe from the cashier to the trouble-shooter and meter-reader.

Causes of and remedies for wasted steam were outlined as follows:

Association, Hotel Statler, Detroit, Mich., June 13, 1929

Waste in the Use of Steam is Caused by:

1. Faulty Operation
2. Lack of Proper Temperature Control
3. Defective Heating Systems
4. Heat in Condensate
5. Defective Building Construction
6. Defective Building Arrangement

Recommended Remedies

To Correct Faulty Operation

1. *Provide Incentive for Good Operation.*
   (a) Cost figures made by engineer.
   (b) Comparative cost figures by building manager.
   (c) Bonus to engineer for efficient operation.
   (d) Comparative consumption figures kept by district steam company.

2. *Check of Operation by Building Manager or Engineer*
   (a) Long-distance thermometers.
   (b) Recording thermometers.
   (c) Recording pressure gauges.

3. *General*
   (a) Steam off at night.
   (b) Steam off during day whenever possible.
   (c) Steam off unused parts of building.
   (d) Using properly sectionalizing mains and other equipment.

To Correct for Lack of Proper Temperature Control

1. *Temperature Control by Hand.*
   (a) Shut off entire system whenever possible.
   (b) Shut off part of system whenever possible.
   (c) Adjust pressures on system.
   (d) Use valves on radiators.

2. *Install Proper Automatic Control.*
   (a) Single electric control for entire system.
   (b) Zoned electric control on parts of the system.
   (c) Unit thermostat control on individual rooms or radiators.
   (d) Direct thermostat control on individual radiators.
   (e) Periodic intermittent control for entire system.

To Correct for Defective Heating Systems

1. *Install Modern Efficient System.*
2. *Correct Faults of Existing System.* (Check and replace where necessary to obtain.)
   (a) Correct arrangement of radiation.
   (b) Proper amount of radiation.
   (c) Proper arrangement of piping.
   (d) Proper sizing of piping.
   (e) Insulation on piping of sufficient amount.
   (f) Radiator valves and traps in good operating condition.
   (g) Reducing valves installed and operating correctly.
   (h) Vacuum pump installed and operating correctly.

To Correct for Heat in Condensate

1. *By Keeping Steam Out of Return Lines.* (Through the use of:)
   (a) Proper use of thermostatic return traps.
   (b) Special heavy-duty traps.
   (c) Water seals.

2. *Make Use of Heat in Condensate.* (By installing:)
   (a) Water-heating economizers.
   (b) Direct or indirect air-heating economizers.

To Correct Defective Building Construction

(Even after a building is completed there are several possible remedies, such as the installation of:)
(a) Weatherstrips.
(b) Storm doors and sash.
(c) Insulation on inside ceilings.
(d) Automatic and revolving doors.
(e) Roof insulation.

To Correct Defective Building Arrangement

1. *Install 24-hour and zone mains and valves.*
2. *Remove obstructions from around radiators.*
3. *Rearrange openings for air circulation to obtain more uniform conditions.*

Considerable interest was displayed in the demand rate, and the effect of the Detroit demand rate on recommendations for "Economy in Operation." The report of the Commercial Relations Committee emphasized that (1) the demand rate was offered as a rate reduction to the larger customers having good load factors, (2) less than 4% of the customers are affected, although about 25% of the output is sold under this rate, (3) economical operation is as important as ever; the rate should take care of itself, (4) the demand should be controlled wherever possible by ordinary care in operation, and (5) these conclusions hold good for present rates and conditions in Detroit, but might be modified by conditions in other cities.

A study of the heat loss survey code proposed by the Heating and Piping Contractors National Association was included in the committee's report. The committee suggested that the association go on record to the effect that:

"The Heating and Piping Contractors National Association has done an excellent and constructive piece of work in the establishment and putting into practice of its method of calculating heat losses. It has undoubtedly hastened the day when some method acceptable to every one will be available, and has presented data in a form similar to the ultimate to be desired . . . We commend their efforts and urge further cooperation with other societies, such as the American Society of Heating and Ventilating Engineers, to the end of securing a method more acceptable to the engineering profession."

It was brought out in this report that:

"On October 2, 1928, representatives from eight national engineering societies, together with invited guests, met at the Bureau of Mines, Pittsburgh, to discuss a uniform basis on which to calculate heat losses. One result of this meeting was a request by the chairman that the various organizations consider the subject and recommend their preference.

"As a representative of the National District Heating Association at this conference, I present an outline of the work that has been done on this subject by the Heating and Piping Contractors National Association. It is the work of this association (H. & P. C. N. A.) that has brought this subject to the fore, and the amount of work they have done on it has been so extensive that it overshadows that of any other

organization at the present time, so far at least as practical, workable data are concerned. The American Society of Heating and Ventilating Engineers has done and is doing considerable research work on this entire subject, but many desirable conclusions of a practical nature have not been reached as yet. The following will therefore be confined to the activities of these two associations.

A.S.H.&V.E. Basis of Calculating Heat Losses

"At the bottom of page 6, of the 1929 A.S.H. & V.E. *Guide*, a statement is given regarding outside temperatures in winter as follows:

"'The outside air temperature used in computing the heat loss from a building is seldom taken as the lowest temperature ever recorded in a given locality. Such temperatures are usually of short duration, and are rarely repeated in successive years. It therefore is evident that a temperature somewhat higher than the lowest on record may properly be assumed in making the heat-loss computations.

"'The outside temperature to be assumed in the design of any heating system must not be more than 15° F. above the lowest recorded temperature as reported by the U. S. Weather Bureau during the preceding ten years for the locality in which the heating system is to be installed. The outside temperature assumed and used in the design should always be stated in the heating specifications.

"'If U. S. Weather Bureau reports are not available for the locality in question, then the U. S. Weather Bureau reports for the station nearest to this locality are to be used, unless some other temperature is specifically stated in the specifications.'

H. & P. C. N. A.

"The method used by this association is more involved, the principal elements of which are as follows:

"1. Assume that the coldest weather occurs during the months of January and February.

"2. Take any three consecutive years as the period on which heat loss calculations are based.

"3. Analyze the temperature and wind velocity for January and February in each of these consecutive years, determining the duration of temperature for each hour, and the direction of the prevailing winds for eight points of the compass.

"4. Assume that one mile per hour of wind velocity is equivalent to 1° Fahrenheit drop in temperature, and in the above analysis substitute equivalent temperatures calculated on this basis for actual temperatures.

"5. As the next step in the analysis, drop from consideration the first twenty-five equivalent degree hours for each of the eight points of the compass. The lowest equivalent temperature then remaining is taken as a preliminary basis of calculation for that particular point of the compass.

"6. Since it is assumed that a wind within a 45° angle on either side of any point of the compass is equally as effective as a wind directly in line with that point of the compass, the preliminary base temperatures, derived as above are adjusted according to the lowest temperatures prevailing on either side within the 45° angle. That is to say, if a base temperature of —2° has been calculated (as above under item 5) for the north side of a building, —8° for the northwest side, and —4° for the northeast side, the temperature for the north side would then be considered as —8°, and known as the adjusted temperature.

"7. After these adjusted temperatures are secured for the eight points of the compass, 15° is arbitrarily added to arrive at the actual base temperature for each of the eight directions.

"8. The highest of these eight temperatures is then established as *the* base temperature for a locality, and a set of direction factors established for each of the other seven points of the compass. These factors are obtained by dividing the temperature difference between inside and outside temperatures of each point of the compass by the temperature difference at the point of the compass for the greatest or base temperature.

"9. After the above base temperatures and direction factors are established, coefficients for heat transmission from various presumably reliable sources are used to establish final factors for all of the elements that enter into building construction; namely, walls, glass, roof, floors, ceiling, air infiltration, partitions, etc.

Comments on A.S.H. & V.E. Method

"The brevity of this method leaves a doubt in the minds of some as to whether or not it is sufficiently comprehensive as a basis for calculations when extensive heating projects are being considered. I share this doubt.

Comments on H. & P.C.N.A. Method

"1. Assume January and February as peak months.

This is true for the United States and probably the Northern Hemisphere.

"2. Use three consecutive years as a basis of time.

"This time element is questionable, due to the fact that yearly temperatures vary over cycles of several years. It is possible that three consecutive years may occur having temperatures much above or below that necessary for base calculations.

"3. Analyze each hour for temperature, wind direction, and velocity.

"This is correct.

"4. Assume one mile per hour wind velocity is equal to 1° F. drop in temperature.

"This procedure is questionable. It may be somewhere near right, but I believe it is subject to fairly accurate scientific determination. Such scientific determination has not been made, so far as I am informed. It is certain that the assumption reduces to an absurdity under some conditions, as, for instance, when a seventy-mile wind prevails at a temperature of 70°, it is certain that the cooling effect is not the equivalent temperature to a temperature of 0° F. in still air. This assumption is basic and affects all future assumptions.

"5. Drop the first twenty-five equivalent degree hours.

"This assumption, combined with the previous one, constitutes a double assumption, and under the best of conditions must be only a matter of judgment.

"6. Adjust temperatures to conform to prevailing winds within 45°.

"This has the effect of multiplying any error which may have been made in the assumptions under item 4 above. It would be highly desirable to see the result of experiments to

prove or disprove this assumption.

"7. Add 15° to secure base temperature.

"This, in fact, becomes a quadruple assumption which might just as accurately be estimated direct from the actual temperature and wind velocities.

"8. Establish direction factors.

"Correct, except for sunlight and exposure.

"9. Transmission coefficients.

"These do not involve any element of argument.

"In an effort to determine the difference of estimates by various individuals, the conditions of the room problem stated by the H. & P.C.N.A. were given to seven men in the heating department of one company. Five of these men figured the problem by the use of factors approved by the A.S.H. & V.E. The results varied from 62 to 59 sq. ft., as compared with 62.3 sq. ft., obtained by the H. & P.C.N.A. in their report. Two men figured the problem by the use of Mills' rule, and obtained 54 sq. ft. as a result. These figures indicate a reasonable agreement between the three methods, and also indicate that, for this problem at least, the H. & P.C.N.A. method gives slightly higher installation recommendations.

"The Committee believes that there is a great deal more work to be done on this subject. The N.D. H.A. should cooperate with the other societies in their praiseworthy efforts to improve our methods of figuring building heat losses. The association should, however, only endorse such data and methods as can be proved to be more satisfactory than the present data and mothods."

In the discussion the subject of distribution losses was taken up. It is customary to compute all the losses in the system as a percentage of the heat output. This figure, consequently, varies widely with different companies, depending on the climate, length of mains, insulation, frictional resistance, etc. Two members recommended that this loss be calculated as a loss in pounds of steam per unit of heating surface, as this would give a more constant figure. One company has found that the loss on such a basis is from 450 to 500 lbs. per sq. ft. of underground heating surface per season.

Station Operating Committee Report

E. E. Dubry, Detroit Edison Company, chairman of the Station Operating Committee, presented the report of his committee.

This report consisted mainly of answers to a questionnaire sent to the heating companies. Among the questions asked were the following:

"What is the tendency toward higher steam pressures in plants which are now being planned or those which will be designed in the near future? What are you doing either in design or operation to eliminate smoke or cinders? Do you make any attempt to select business so as to improve the plant load factor?"

The consensus of opinion seemed to be that no higher pressures are contemplated than are now being used. Smoke and cinders are reduced as much as possible by the use of cinder catchers, frequent cleaning of the baffles and stacks and by use of large combustion chambers. With few exceptions, no business is refused and no demand rate has been established to improve the load factor. So far only the larger companies have taken any active steps toward establishing a demand rate.

At the morning session, June 12, the report of the Committee on Rates and Regulations was presented, following which Dean A. A. Potter, of Purdue University, addressed the convention on "Thermodynamics of District Heating Operations." Dean Potter defined the units of thermodynamics and explained the various steam cycles. He made the prediction that plants will soon be operating at temperatures from 750° to 1000° F., and told of the high-pressure plant in Cincinnati designed for 1800 lbs. pressure.

By the use of charts, the dean then showed that the efficiencies of the cycles were in the following order, with the lowest efficiency first:

Rankine, 750°
Reheating, 750°
Rankine, 1000°
Reheating, 1000°
Regenerating, 750°
Reheating-regenerating, 750°
Regenerating 1000°
Reheating-regenerating, 1000°

It was pointed out that with an initial pressure of 2000 lbs. three-quarters of the work in the steam is available at 28 in. of mercury.

At the close of his address, Dean Potter was given a rising vote of thanks for his cooperation with the association, including his support of the school held at Purdue.

S. F. Delaney, chairman of the Hot-Water Committee, was unable to be present to give the report of his committee. The discussion included comments by Henry Meyer, of Terre Haute, and D. L. Gaskill. Mr. Meyer praised the work of Mr. Delaney and his committee, and Mr. Gaskill stated that this year's report is the most comprehensive and complete report ever submitted by a hot-water committee. He urged that the members give the serious consideration to the report that it deserves.

At the morning session, June 13, the report of the Distribution Committee was presented. J. F. Lincoln, Lincoln Electric Company, described "Welding of Distribution Mains," from the standpoint of electric welding, and illustrated his talk with slides. This was followed by a discussion and motion pictures on "Oxy-Acetylene Welding as Applied to District Steam Distribution Mains," by Glenn O. Carter, consulting engineer of The Linde Air Products Co., New York.

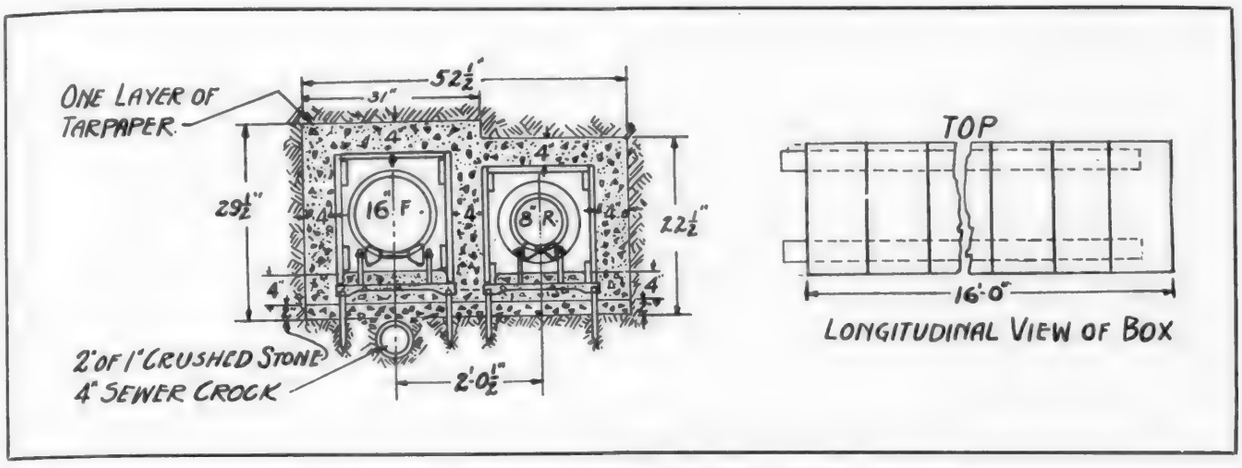
Replies from representative companies to a questionnaire sent out by this committee indicated that steam velocities are not a controlling factor in the design of mains, the size of pipe being governed by the pressure drop.

Description of 16-In. Main in Detroit

Special attention was paid to the installation of a 16-in. main by The Detroit Edison Company, described by A. A. Sellke. The low cost of this installation was the subject of some comment by representatives of other companies. The paper, in full, follows:

"Early during the year 1928, The Detroit Edison Company contracted to heat two of the largest office buildings in Detroit, namely, The General Motors Building and The Fisher Building. Their combined estimated yearly consumption was 184,953,000 lbs. of steam.

"These buildings were over a mile distant from our Willis Avenue Heat-



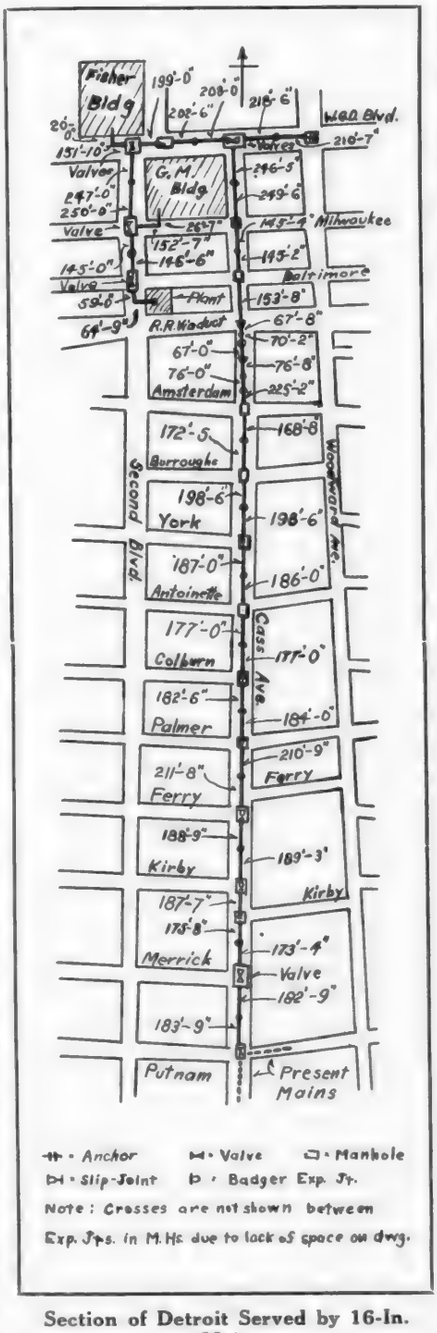
Details of 16-In. Main Installation, The Detroit Edison Company

ing Plant. This plant was the nearest one to the aforementioned buildings.

"To supply the additional boiler capacity required, the private plant which formerly served The General Motors Building, located a block away, was purchased and another boiler was installed in the Willis Avenue Heating Plant. The new center of load thus established was tied in with the main portion of the distribution system by means of a 16-in. pipe, as shown in the map.

"In accordance with our specifications for feeder construction, standard weight lap welded steel pipe with ⅝-in. wall thickness was required to be installed in a concrete envelope. Our calculations indicated it would be more economical to install a welded line than one with screwed couplings or flanged joints. Competitive bids were obtained from various concerns on the welding. Painting, covering, and pipe fitting were to be done by our own men.

"Considering cost of trenching and heat losses, a 1½ in. thickness of asbestos sponge-felted pipe covering with waterproof jacket was found to be most economical. It was considered advisable to use extra heavy C. I. flanged fittings in the manholes and to connect these fittings to the pipe by means of Van Stone flanged nipples, one end of which was to be welded to the pipe. The only other fittings used in the entire line of 7,200 ft. were six Badger expansion joints. These joints were used to eliminate manholes under a railroad viaduct which were very likely to become flooded during heavy rains. The concrete envelope in this section was



Section of Detroit Served by 16-In. Main

also made more impervious to water by adding a greater proportion of cement to the aggregate.

"Cast-steel anchors designed to clamp around the pipe were used. These were held in place by four pads welded to the pipe. A maximum distance of 250 ft. was allowable on the slip joints, which were designed for 10 in. travel. Cast-steel guides were located 5 ft. and 20 ft. from the slip joints. Manholes were built having 12 in. brick walls, with anchor lugs embedded in the brickwork. These lugs could be connected to the flanges of the fittings or to the lugs on the slip joints. Practically all manholes were located at street intersections to allow for branches to be taken off the feeder in the future. The pipe, supported by brackets and rollers, was enclosed in a wooden form 1 in. thick, which in turn was surrounded by 4 in. of concrete.

"It was found advisable to get the return water from the two buildings back to the nearest plant, and to provide for this an 8-in. cast-iron flanged pipe was incorporated in the design. The return line was run adjacent to and in the same trench with the feeder but in a separate conduit. With the exception of the downtown section, served from tunnel mains, this is the only return line we have underground. This double construction constitutes about 1,100 ft. of the total of 7,200 ft. of pipe.

"Drawings were made showing plans and profiles of the proposed construction, and it was quite surprising to find how closely these plans could be followed in the field.

"Trenching for the line was done to a large extent with a Parsons

trencher and very little difficulty was experienced with street-lighting conduit, water and gas services en route. It was one man's duty to be on the lookout for any obstructions crossing the trench and to give sufficient warning to the operator. The entire line of trench was in pavement, and the pavement was broken out 6 in. wider than the actual trench width to facilitate trencher operation.

"One crew of men worked in conjunction with the trenching machine, trenching and bracing the ditch. This crew also installed the 4 in. vitrified sewer under drain and the concrete base supporting the brackets and rollers. A second crew of men lowered the pipe in place. Next, the welding contractor welded the line and our own men tested it for leaks with 500-lb. hydraulic pressure. Only one defective weld was found.

"After testing the line our men painted the pipe with a coat of nitrose paint and then covered it. The second crew of men installed the conduit around the pipe, backfilled the trench, built the manholes, and replaced the pavement base.

"All the work was done under the supervision of our engineers, whose careful planning caused practically no interference with traffic conditions, likewise maintaining a friendly spirit of cooperation among contractors.

"A resume of the cost of various items or operations in connection with the job follows.

"Total installation cost of 16-in. main (250-lb. W.S.P.) in Cass Avenue, from Putnam Street to West Grand Boulevard, and in West Grand Boulevard, from Woodward Avenue to Second Boulevard. (Overhead costs, etc., included in table above.)

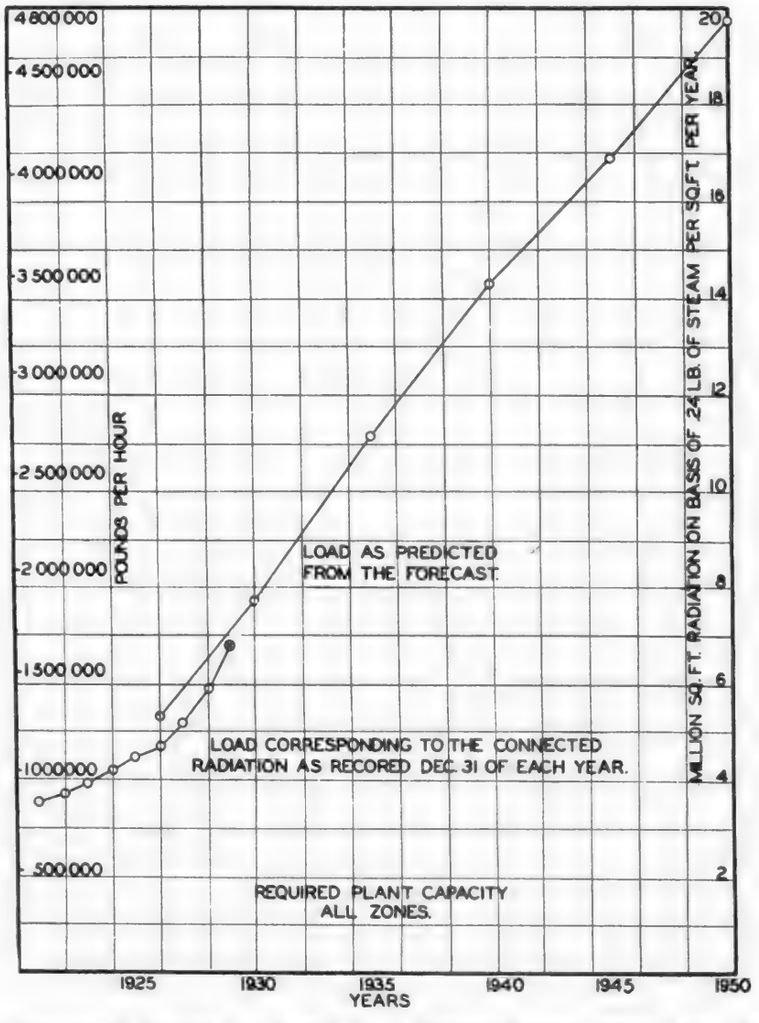
This installation was mentioned and illustrated in an article by E. E. Dubry, "Central Heating in Detroit, Part II," which appeared in THE HEATING AND VENTILATING MAGAZINE for May, 1929.

Conduit and manholes—	
"Concrete conduit (5,949 lineal ft. in asphalt @ $3.65)	$21,713.85
17 brick manholes (av. $734.38, av. 564.6 cu. ft.)	12,484.54
	$34,198.39
Pipe, slip-joints, fittings, guides, etc.—	
5,975 ft. of 16-in. pipe	$13,633.20
Slip-joints, fittings, valves, etc.	11,176.70
Miscellaneous material	4,512.59
Insulation	11,230.75
Pipe installation labor, including welding	12,836.22
	$53,389.46
Removal of interferences, changes to drains and sewers	$2,066.63
Excavation, backfill, and repaving—	
Excavating and backfill, 5,949 lineal ft. @ $8.67	$51,593.35
Asphalt resurfacing, city permit, and inspection	4,239.97
Street repair	5,651.55
	$61,484.87
Misc.—Construction expenditures (includes engineering, supervision, overhead costs, etc.)	$11,100.44

Grand total—$162,239.79.
Length—6,180 ft. of 16-in. main (5,949 ft. of trench).
Cost per foot of main—$26.25 (manholes included)."

Detroit Edison Extensions Based on Forecast

An address by J. Rowland Bibbins, of Washington, D. C., on "City Planning for the Future—Can It Be Forecasted?" excited considerable interest. Mr. Bibbins has been engaged for some time in preparing a report for interested utilities in Detroit,



Forecasted Growth and Actual Load, District Heating System, Detroit

in an effort to determine if a forecast of building development in that city could be made. His conclusions were that:

"1. The probabilities are that the building cubage of the one-mile circle from the City Hall will more than double by 1950. Over 2,000,000,000 cu. ft. of buildings will be added to the 1,000,000,000 already existing in the whole survey area—the future 'Central District.' Land values will more than treble, adding over $1,000,000,000 in assessed land value and about 16,000,000 sq. ft. of residence land will be converted to business purposes.

"2. Remarkably consistent laws and trends of economic growth have developed from this analysis, considering the number and obscurity of the variable factors involved and viewed in the large.

"3. New building cubage distribution and concentrations *in the mass* may be allocated by the aid of these laws and trends, with the exercise of reasonable judgment as to the character of the locality."

From the detailed information furnished by Mr. Bibbons, The Detroit Edison Company worked out a master layout of its future distribution system, and extension and renewals are being made according to this plan.

At the closing session, June 14, the reports of the Meter and Accessories Committee and the Promotional Committee were presented. The Nominating Committee then submitted the list of officers for the coming year and the following men were unanimously elected:

New Officers

President, J. C. Butler, Illinois Maintenance Co., Chicago.

First vice-president, L. S. Smith, Rochester Gas and Electric Corp., Rochester, N. Y.

Second vice-president, W. W. Stevenson, Allegheny Steam Heating Co., Pittsburgh, Pa.

Third vice-president, A. D. Leach, Northwestern Electric Co., Portland, Ore.

Secretary-treasurer, D. L. Gaskill, Greenville, Ohio.

Executive Committee, E. E. Dubry, The Detroit Edison Company; J. E. Seiter, Baltimore Gas, Electric Light and Power Co., Baltimore, Md., and J. W. Meyer, Philadelphia Electric Co., Philadelphia, Pa.

The annual banquet, June 13, was attended by 175 guests, entertainment being furnished by a special orchestra, several dancers and singers, and a mind reader who mystified the spectators for an hour. At the banquet, attractive silver cigar lighters for the desk were presented to the men present by the Central Station Steam Company.

Anthracite Sizes for Domestic Use

That adequate heater capacity, uniform fuel quality, and clean, low-ash coal are all of far greater importance than the sizing of anthracite was one of the conclusions reached by R. H. Fernald in his report on "Anthracite Sizes for Domestic Use," issued by the mechanical engineering department, Towne Scientific School, University of Pennsylvania, and telling of the research on this subject carried on by the university in cooperation with the Anthracite Operators' Conference. It was found that, in general, for all mixtures of sizes of anthracite tested, ranging from standard commercial egg to mixtures of 40% pea and 60% buckwheat, standard buckwheat proved least efficient.

For heaters with relatively thin fuel beds, the savings in fuel consumption by the use of sizes smaller than standard commercial egg was from 8% to 11%. For heaters with relatively deep fuel beds, the saving in fuel consumption by the use of properly selected mixtures of sizes smaller than standard commercial egg may be of the order of 10% or better.

The tests covered a complete series made with three general anthracite sizes —egg, chestnut and pea. The egg series consisted of varying proportions of egg with stove, egg with stove and chestnut, and egg with stove, chestnut and pea. The chestnut series included different proportions of chestnut with pea and buckwheat, while the pea series consisted of pea with varying proportions of buckwheat.

Tests were made on the following types of equipment: Sectional water-tube heating boiler; magazine-type heating boiler; vertical round boiler; hot-water supply boiler; warm-air furnace; hotel range, and household range. To minimize errors due to inaccuracies in the determination of the amount of fuel used and to meet practical household operating conditions and other variable factors, the duration of each individual run on each type of fuel was set at one week, that is, seven consecutive 24-hr. days, without interruption after the fires were properly cleaned and conditioned.

Instead of running the tests at rated capacity, the load assumed was 60% of the manufacturer's rating which it was felt represented a fair average maximum demand under conditions of continuous operation. Both steam and water boilers were tested as water heaters.

Bar charts are used to show, in an effective manner, the relative efficiencies of the different heaters with the various mixtures of fuels, with shaded portions representing the proportions of the different sizes. Size 6 in. x 9 in. Pp. 75.

Boiler Test Plant at University of Pennsylvania

Willard P. Davenport

Glancing Backward

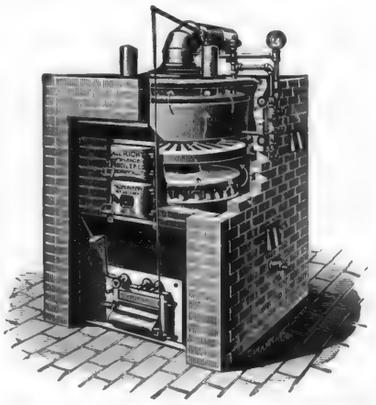
XIV—The Wm. H. Page Boiler Company

BACK in the middle of the last century, at Norwich, Conn., a man who was sure he could improve upon all methods of heating up to that time was designing and producing various forms of heating boilers which were surprisingly successful. That man was William H. Page, who, in 1856, founded The Wm. H. Page Boiler Company for the purpose of engaging in the manufacture of heating boilers.

Many of the earlier boilers produced by Page and installed in neighboring New England communities were improved upon and discontinued until the All Right round sectional boiler was introduced about 1875. The All Right boiler, considered for some time the last word in boiler design, today would be considered cumbersome and costly of erection. It was made up of a round firepot, alternate "closed" and "open" cartwheel sections, surmounted by a vast dome. Joints between the sections were made tight with iron filings and cement, forming what is termed a rust joint. Finally, the boiler was encased in brick work.

About the same period Page designed and put into production one of the first cast-iron square sectional boilers, also brick-set. This boiler, the Page Safety, was made of vertical sections, connected to header and manifolds by lock-nut threaded nipples. It was cast in very heavy metal, and extensively used for years for both heating and power purposes. A number are still giving service in old buildings that somehow or other have escaped demolition.

In these days of mass production, when materials are handled mechanically, when machines replace hand-molders, and other precision machines complete the product, it is hard to comprehend the difficulties encountered by the pioneers in our industry. The first Page boilers were manufactured in a very small foundry, one that to present-day production engineers would seem entirely inadequate. Practically every operation was slow and laborious. Yet



Page All Right Boiler, 1875-1890

good and workable boilers were produced, in spite of the fact that trial was the only road to progress and the foundry the only research laboratory available, with practically none of the present-day test equipment at hand.

Demand for Page boilers increased—the foundry capacity increased as well, and manufacturing equipment improved. Production by machine in large volume was soon to come.

Portable boilers, which could be erected without the brick-setting of the early constructions became popular at this time. This led to the design of a round boiler, the Volunteer, to replace the All Right, and a square boiler, the Monarch, to replace the Page Safety.

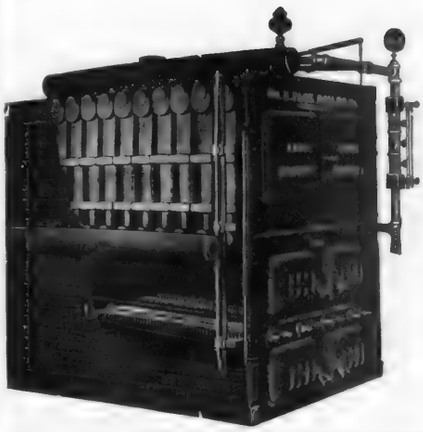
The Volunteer was first made with sections similar to those of the old All Right, except that the connection between sections was a screw nipple, and the outer brick wall was replaced by sheet iron, and later by a cast-iron jacket. Patents were granted on this boiler December 8, 1878, and October 17, 1893, and this same boiler in improved form, with push nipple connections, is still on the market.

Following the trend in industry to utilize the appeal of color, this Page round boiler was jacketed in red and black sheet metal and designated as the Page Red Diamond.

Immediately following the Page Safety, the Monarch square sectional boiler was made only in what has been termed the header type, with sections connected to header and manifolds by lock-nut threaded nipples. Today the Monarch is made with both screw and push nipple connections.

Mr. Page designed and patented a number of cast-iron sectional boilers, in

The Wm. H. Page Boiler Company's Plant, Meadville, Pa., 1920



Page Safety Sectional Boiler, 1880-1905

both round and square form. In some, such as the Hornet, the parlor stove influence is plainly perceptible. Many of the improvements in boiler design and heating practice were the result of Mr. Page's untiring efforts. Also, he designed the triangular grate bar, now universally used.

Manufacture of Page boilers was continued at Norwich until 1908. Then, having outgrown the facilities there, a modern plant was erected at Meadville, Pa., on a site which provided room for expansion in the years to come. Almost immediately this plant was pushed to capacity to take care of increasing business, and so year by year structure and machine equipment have been augmented, until today the Page plant has a greater production than ever before.

At the same time the plant was removed to Meadville, the general offices of the company were transferred to New York, where they now are located, under the direction of Willard P. Davenport, vice-president and general manager, who has been identified with the development of the business since 1900.

Prior to his affiliation with the Page interests, Mr. Davenport was connected with the Exeter Machine Works, which company made the first cast-iron, vertical, square sectional boiler in the United States, the invention of George B. Brayton. This boiler was first used for power on a railroad locomotive, operating in the State of Rhode Island.

Boiler and Radiator Manufacturers Form Institute

Including almost every manufacturer of low-pressure boilers and radiators in the United States, a new organization, the Institute of Boiler and Radiator Manufacturers, completed its formation at a meeting of the executive committee in New York, June 12, 1929. Immediate commencement of operations along the lines of the Trade Conference of the Heating and Plumbing Industry, held by the Federal Trade Commission in Pittsburgh, May, 1929, was planned.

Prominent among the new institute's activities will be an unfair competition bureau which will be maintained by the institute, for the purpose of investigating and reporting to the Federal Trade Commission any violations in the boiler and radiator industry of any of the rules adopted at the Pittsburgh conference when approved by the Federal Trade Commission, and also any instances of discriminations by manufacturers of boilers and radiators in prices quoted to customers in the same competitive class, that are in violation of the Clayton Act as interpreted by the Supreme Court last January in the American Can case.

The membership of the Institute of Boiler and Radiator Manufacturers comprises the following:

American Radiator Co., New York, N. Y.
United States Radiator Corp., Detroit, Mich.
National Radiator Corp., New York, N. Y.
Richardson & Boynton Co., New York, N. Y.
Abendroth Brothers, Port Chester, N. Y.
Molby Boiler Co., Inc., New York, N. Y.
Central Radiator Co., New York, N. Y.
Fowler & Wolfe Mfg. Co., Norristown, Pa.
Landon Radiator Co., Inc., North Tonawanda, N. Y.
Columbia Radiator Co., McKeesport, Pa.
Freed Heater Co., Philadelphia, Pa.
Lincoln-Niagara Corp., Inc., North Tonawanda, N. Y.
Hart & Crouse Co., Utica, N. Y.
The Putnam Co., Putnam, Conn.
Raritan Boiler Co., Raritan, N. J.
Richmond Radiator Co., New York, N. Y.
Spencer Heater Co., Williamsport, Pa.
Thatcher Co., Newark, N. J.
Utica Radiator Co., Utica, N. Y.
Dunkirk Radiator Co., Dunkirk, N. Y.
Pierce, Butler & Pierce Mfg. Corp., New York, N. Y.
H. B. Smith Co., Westfield, Mass.
Weil-McLain Co., Michigan City, Ind.
L. J. Mueller Furnace Co., Milwaukee, Wis.
Wm. H. Page Boiler Co., New York, N. Y.
Burnham Boiler Co., Irvington, N. Y.
Federal Radiator Co., Irvington, N. Y.
Abram Cox Co., Philadelphia, Pa.
International Heater Co., Utica, N. Y.
Republic Radiator Co., Baltimore, Md.
Ideal Boiler & Furnace Co., Detroit, Mich.
Logansport Radiator Co., Logansport, Ind.
Prox Boiler Co., Terre Haute, Ind.
Peerless Boiler & Radiator Co., Boyertown, Pa.
Newport Boiler Co., Philadelphia, Pa.

The officers of the institute are: chairman, H. T. Richardson, Richardson & Boynton Company; vice-chairman, Grant Pierce, National Radiator Corporation; secretary and treasurer, F. W. Herendeen, Geneva, N. Y. Executive Committee: chairman and secretary, ex-officio, and following five gentlemen: M. J. Beirn, American Radiator Company; E. E. McNair, United States Radiator Corporation; M. D. Rose, Pierce, Butler & Pierce Mfg. Corporation; A. H. Schroth, Richmond Radiator Company; Grant Pierce, National Radiator Corporation.

Sales Outlook for Small Boilers and Radiators

Discussing the subject of merchandising boilers and radiators, at a recent meeting of the National Pipe and Supplies Association in Pittsburgh, W. M. Cosgrove, vice-president, American Radiator Co., New York, said: "During the past fifteen years, boilers and radiators have changed from a minor to a major part of the wholesaler's business. Today they represent 10.2% of the total business of the wholesalers in heating and plumbing supplies, compared with 15.5% on enamelware, and 16.5% on pipe. In individual cases, boilers and radiators represent 25% to 33-1/3% of the wholesaler's gross business.

"The greatest fertility of sales," continued Mr. Cosgrove, "is the small house and residential building construction, for the reason that per square foot of floor space, more tonnage of boilers and radiators is sold. Especially is this true of cast-iron, house-heating boilers.

"A decided falling off in the sales of speculative houses occurred in the last six months of 1928. Consequently, many thousands of houses have been carried over in 1928, with loss of profit, strained credit, and financial failure. Due to this condition, the demand for boilers and radiators has lessened materially for the first four months of 1929.

"Obtainable figures forecasting the future are not reassuring. Data on contracts awarded show that the number of residential buildings has declined about 19% for the first four months of 1929, as compared with the corresponding period for 1928.

"The increasing tendency of the American public to live in apartment houses also plays its part in decreasing the volume of sales of boilers and radiators.

Increase of Families Living in Apartment Houses

Living in—	Percentage of families 1921	1927
one-family houses	58.3	38.3
two-family houses	17.3	13.4
multiple-family houses	24.4	48.3

In conclusion Mr. Cosgrove said, "The current month's sales would indicate that the lowest ebb has been reached, and while it is doubtful whether 1929 holds the same volume as 1928, still we are encouraged in the belief that succeeding months will show less sharp declines and perhaps, toward the end of the year, some slight increases over the corresponding months of 1928.

"This will require a determined effort by all engaged in this industry to offset the loss of business in building construction by an increasing percentage of heating material sold for rehabilitation work."

The Late Henry W. Wendt

Henry W. Wendt

A leader long identified with the heating, ventilating, and air conditioning industry passed on when Henry W. Wendt, president of the Buffalo Forge Company, died at his home in Buffalo, June 12, after a brief attack of pneumonia. Mr. Wendt was within seven days of being sixty-seven years old. Born and educated in Buffalo, he lived there all his life, being connected throughout his business career with the company of which he later became president.

Established in 1878, by his late brother, William F. Wendt, the company first manufactured blacksmiths' forges, from which it took its name. It also manufactured other blacksmith shop equipment.

Himself a natural engineer, though with only a public school education, Mr. Wendt was soon placed in charge of the manufacturing activities and frequently introduced new methods in the various departments. Known as an expert foundryman, in later years he was president of the American Foundrymen's Association. Under his direction the foundry of the Buffalo Forge Company achieved an enviable reputation for turning out difficult castings.

It was at Mr. Wendt's suggestion that the Buffalo Forge Company first engaged in the manufacture of fans and heating apparatus. For some years he was the only salesman for fan equipment, as well as playing the parts of designer and manufacturer. A few of the older contractors here and there recall with pleasure an acquaintance with him which dates back to those early days.

A great many inventions of practical value have been laid to the credit of Mr. Wendt, and to an unusual degree he possessed the combination of an inventive mind with a sense of practical value. Undoubtedly this had much to do with his success. However, those who knew him best like to think of the man himself and the fairness and frankness with which he met every situation, business as well as personal.

Later he became works manager and, in 1910, when the company was incorporated, he was elected vice-president and treasurer, and in 1916 was elected president.

Mr. Wendt was for many years especially interested in research work. However, he did not dignify it by that name. Facts were what he wanted and he was willing to spend money to obtain them. This was rather unusual thirty years ago. At that time accurate knowledge of fan performance was limited and certainly was nowhere available in published form. The Buffalo Forge Company was one of the first to publish data for general use. Mr. Wendt made it possible for Willis H. Carrier to start the work, first on heating, and, later, on air conditioning, which brought both of these activities nearer the status of exact sciences. Since then Mr. Carrier has developed many of his ideas into fields then unthought of.

Mr. Wendt's appreciation of the value of research was evident when the American Society of Heating and Ventilating Engineers decided to set up its Research Laboratory. Mr. Wendt was the first manufacturer to pledge his support over a period of years and urged other manufacturers of ventilating apparatus to do the same. This support never had been withdrawn.

Henry W. Wendt was the first president of the National Association of Fan Manufacturers, a founder of the Hydraulic Association, a member of the American Society of Heating and Ventilating Engineers, and the American Society of Mechanical Engineers. He was a 32nd Degree Mason, a member of the Commandery, a Rotarian, and former director of the Chamber of Commerce.

Besides being president of the Buffalo Forge Company, he was also president of the Buffalo Steam Pump Company, the George L. Squier Mfg. Company, and the Canadian Blower and Forge Company, Kitchener, Ont. His interests in the employees of all these companies was personal and warm. In 1920, he established a "Baby Check Fund" from which $50 was paid to the mother of each baby born to an employee.

His companies also established group insurance, applied to all employees, besides which it had been his practice for many years personally to duplicate all sick and death benefits paid by the Employees' Benevolent Association.

Surviving him are his widow, Edith M. Wendt, and two sons, Edgar F. and Henry W. Wendt, Jr.

Oliver Ames

Oliver Ames, senior member of the board of directors of the General Electric Company, died at his home in North Easton, Mass., June 18, at the age of 65. Mr. Ames had been a member of the board since 1893, being elected at that time to fill a vacancy caused by the death of his father, who previous to the formation of the General Electric Company was a director of the Thomson-Houston Company.

Heat Exchange Between the Human Body and Its Environment

A valuable contribution to the literature on the subject has been made by the authors of "Thermal Exchanges between the Human Body and Its Atmospheric Environment." Originally published by the American Society of Heating and Ventilating Engineers, this paper also has been published in *The American Journal of Physiology* for April, 1929, and has been reprinted as a pamphlet by that journal.

The paper contains the results of a series of 267 tests made on seven normal male subjects at the Pittsburgh Experiment Station of the United States Bureau of Mines. The effective temperatures ranged from 6.7° to 37.8° C., with relative humidities of 20% 45%, 70% and 95%, in still air and with moving air at velocities of 1.19 and 1.96 meters per second (235 and 385 ft. per min.) A minimum of 53.4 calories per square meter per hour was found for the temperature range from 19.3° to 28.7° C., a value in close agreement with results obtained by other investigators for men under like conditions. For both higher and lower temperatures there is an increase in the metabolic rate.

Total heat loss from the body is divided into loss by evaporation and the combined loss by radiation and convection. Both of the latter were shown to be functions of the dry-bulb temperature.

Change from insensible to sensible perspiration takes place at 22.8° and 23.9° C. effective temperature with 95% and 20% relative humidity, respectively.

The authors are F. C. Houghten, W. W. Teague, W. E. Miller and W. P. Yant, all of the Research Laboratory of the society.

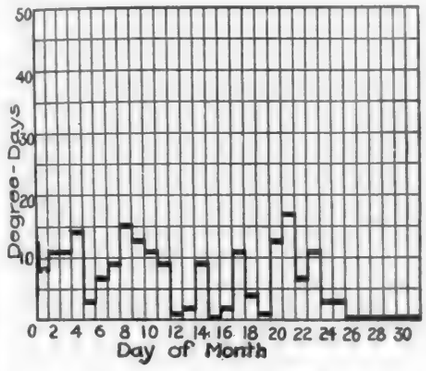
Monthly Heating Load in Degree-Days in Nine Typical Cities

DEGREE-DAY charts for representative cities in the United States are presented for use by heating contractors, house-heating managers of gas companies, heating appliance salesmen, and others interested in fuel consumption. At the end of the season these graphs can be pasted together and the heating load will be represented by a continuous line for the season.

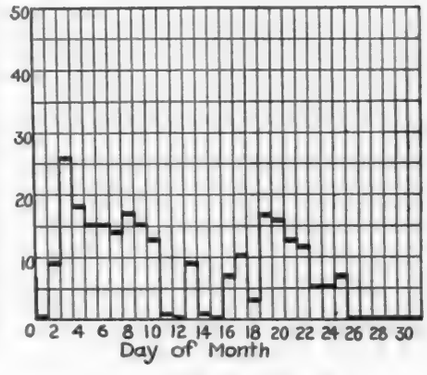
The degree-day is a unit coined by the American Gas Association and is the product of 1° in temperature and 1 day. When the average daily temperature falls below 65° the heating load is proportional to the difference between the daily temperature and 65°, and the number obtained represents the number of degree-days for that day.

When the average daily temperature is 54°, for example, the number of degree-days for that day is (65-54) or 11. When the average temperature is 40°, the degree-days total 25.

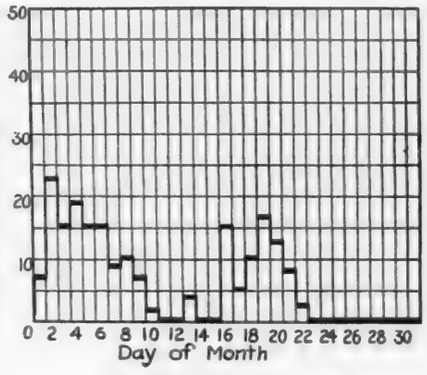
The total number of degree-days for a given month when divided by the yearly total will give the percentage of heat demand for that particular month. Unit fuel consumption figures, in quantities of fuel per degree-day per square foot of radiation or per square inch of leader pipe, are available for different fuels, different types of heating systems and for various grades of fuels, so that fuel consumption problems can readily be solved by applying degree-day data.



New York, May, 1929
Degree-Days 195—Degree-Days to Date 4894



Pittsburgh, May, 1929
Degree-Days 258—Degree-Days to Date 5386



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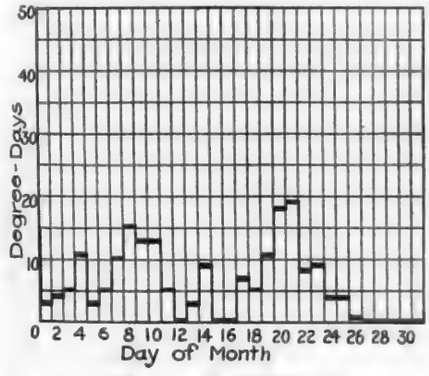
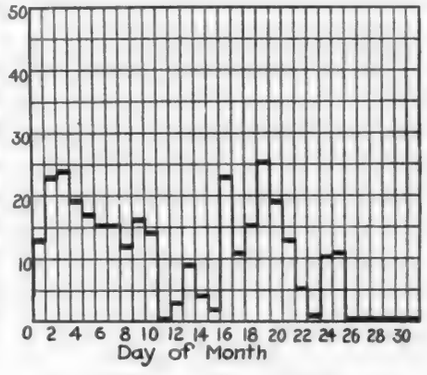


Boston, May, 1929
Degree-Days 185—Degree-Days to Date 5363



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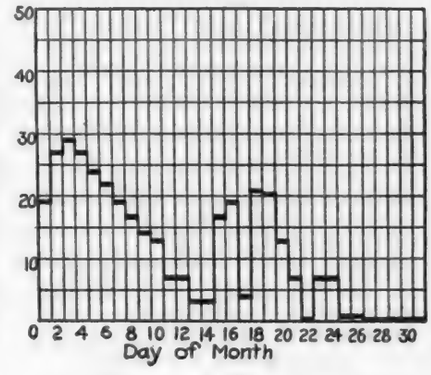
Degree-Days 314—Degree-Days to Date 6309



Minneapolis, May, 1929
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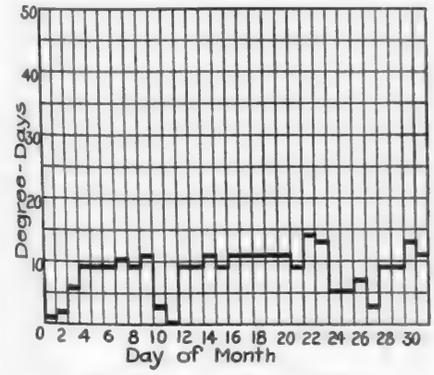
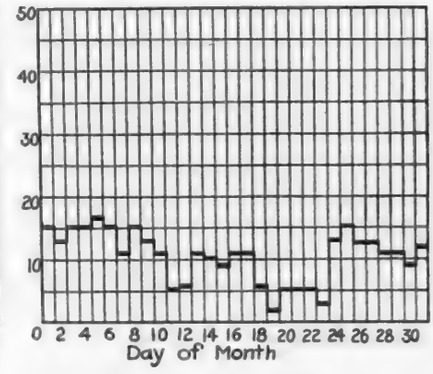
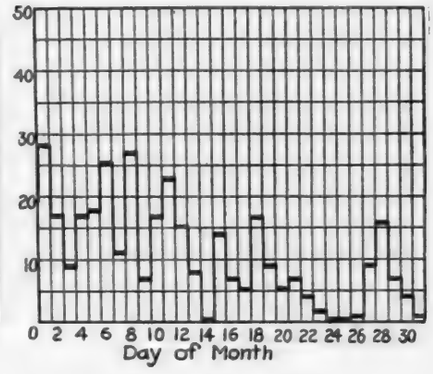


San Francisco, May, 1929
Degree-Days 260—Degree-Days to Date 2931



Seattle, May, 1929
Degree-Days 326—Degree-Days to Date 5123



Denver, May, 1929
Degree-Days 230—Degree-Days to Date 6242

Utica Radiator Corporation's Plant in Production

Incorporated in November, 1928, the Utica Radiator Corp., Utica, N. Y., has been in production for several months, and starting June 1 has had a complete line of radiators ready for shipment. The plant is that formerly occupied by the Lincoln Radiator Corporation on Dwyer Avenue, and is equipped to melt 120 tons of iron per day. Ten acres of land which adjoin the plant provide plenty of room for expansion.

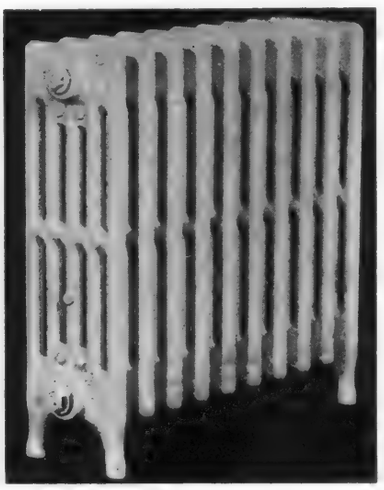
All new machines, pattern and molding equipment were provided for the new plant, including oil-fired core baking furnaces. The line of tubular radiators consists of 3, 4, 5, and 6-tube types with heights of 23, 26, 32 and 38 in., and a 7-tube, 28-in. window radiator.

Officers of the company are: President, E. C. Reed; vice-president, L. N. Murray; vice-president and treasurer, W. C. Murray. Mr. Reed formerly was vice-president in charge of sales of the National Radiator Corporation and president of the Lincoln Radiator Corporation. Mr. L. N. Murray was treasurer of the Continental Heater Corporation, and Mr. W. C. Murray formerly was manager of the Lincoln Radiator Corporation.

Minneapolis-Honeywell Acquires Important Patent

Edgecombe-Reissue Patent No. 15,531, of particular interest to the warm-air furnace industry, has been purchased by the Minneapolis-Honeywell Regulator Co., Minneapolis, it is announced by the company. The patent, it is stated, applies to control of warm-air circulating fans and hook-ups for gas, oil, and coal-burning units. Most important is said to be the hook-up of a furnacestat, which when inserted in the furnace, starts and stops the fan according to temperature changes.

In connection with the acquisition of



5-Tube Utica Radiator

the Edgecombe patent, the company announces the development of a new type furnacestat which is now in production and which is similar to the new high voltage Airstat. It is scaled from 0° to 600° F. with an approximate leg of 35°, depending upon rapidity of rising temperature.

New Engineering Building for Crane Company

The engineering building is a recent addition to the Chicago works of the Crane Company, and consists of a two-story brick 80 ft. by 500 ft. building. The basement is connected by a tunnel 20 ft. wide, with the plumbing brass department across the street.

The first floor is divided into five rooms, accommodating the plumbing-testing department, exhibit material department, electrical department, boiler and radiator testing department and pattern storage department.

In the radiator testing department is a complete cork insulated test room, surrounded by a chamber containing a refrigerating machine for regulating the temperature in the test room from normal temperature to 10° below zero.

Several chimneys of various diameters and heights to give any combination of draft are built to be used in connection with boiler testing.

The second floor is used by the product engineering department, plumbing engineering department and metallurgical department. The function of the engineering department is to develop and design valves, fittings, pipe bends and other specialties for power plants and general manufacturing processes as well as the development and design of boilers and radiators.

This department consists of a large number of development and test engineers, designers, draftsmen, estimators and special order men, who not only develop new lines of material but also are engaged in making improvements in the present products.

The experimental engineering laboratory conducts investigations pertaining to the application of materials to the product of the Crane Company.

Crane Company Engineering Building

Williams Oil-O-Matic Convention Largest Ever

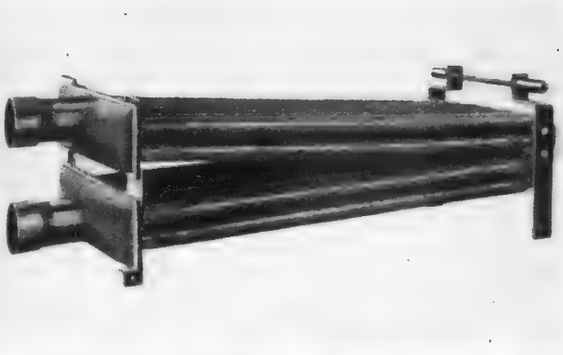
New products for the oil dealer and distributor were shown, for the first time, to 3000 delegates from all over the United States and foreign countries, at the fifth international convention of the Williams Oil-O-Matic Heating Corp., in Bloomington, Ill., June 3-7.

A new small oil-burner, known as Oil-O-Matic Junior, a full line of cabinet heaters, and an inexpensive heating stove, all designed to supplant coal and wood-burning heaters, Ice-O-Matic Junior, for apartments and small homes, a larger ice machine and the most varied line of cabinets ever displayed by the corporation, were shown to the assembled salesmen, dealers, and service experts.

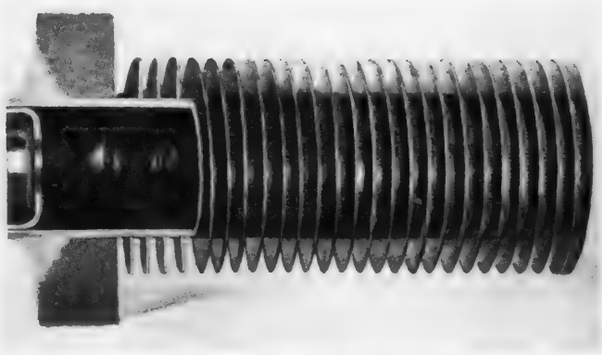
In attendance and number and extent of exhibits, the convention was declared to be the largest ever conducted in the oil-burner industry. Poor and good dealer methods were contrasted in a two-act comedy presented by professional artists. Emphasizing the market for replacements, stove renewals and replacements on American farms annually number more than 700,000, it was brought out.

Among the speakers at the convention were John P. Roche, president of the Roche Advertising Company; Homer Linn, American Radiator Company; C. U. Williams, president, Walter W. Williams, vice-president and secretary, and R. D. Marshall, all of Williams Oil-O-Matic Corporation.

There were 32 exhibitors.



York Super-Fin, Showing U-Tube Construction and Welded Headers



The Tubes of the York Super-Fin Are United to the Headers by Fusion

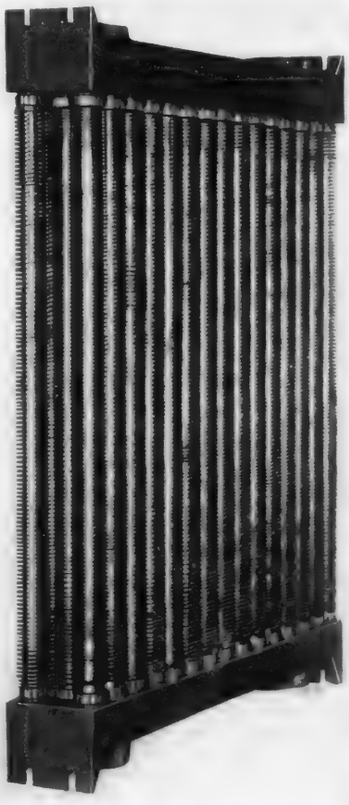
Manufacturers Show Ingenuity in Design of Light-Weight Radiation

SUPPLEMENTING the story of the evolution of light-weight heating surfaces, which appeared in HEATING AND VENTILATING for June, other interesting types reproduced herewith supply further evidence of the rapid progress in this field and the various applications of the fin idea to non-ferrous heating surfaces.

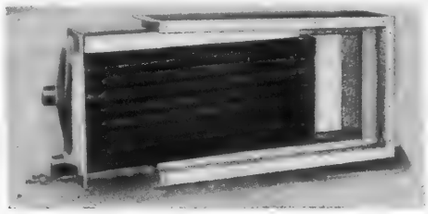
An interesting story is told of the problem involved in the construction of the York super fin heater. For a time manufacturers despaired of being able to weld the copper tubing to the steel heaters, owing to the fact that the heat necessary to melt the steel in the headers was more than the copper tubing could stand. The York company finally hit upon the expedient of inserting the tubes in a bath of water during the welding process, and in this way the excess heat was absorbed by the water.

In the Young unit the heating surface consists of flattened vertical copper tubes to which are sweated or fused rows of flat copper fins.

In the Thermal unit heater, the core, which is of streamline design, is integrally cast without welds, joints, flanges or brazed or soldered connections.

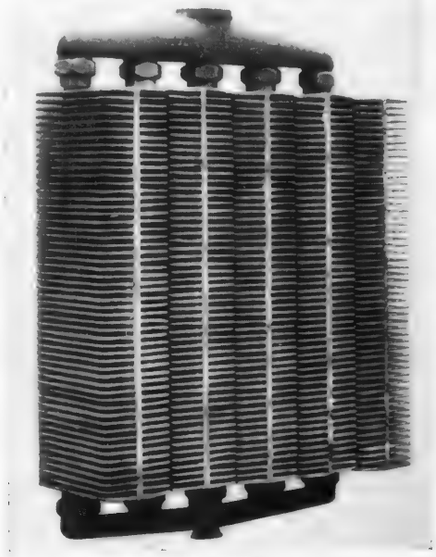


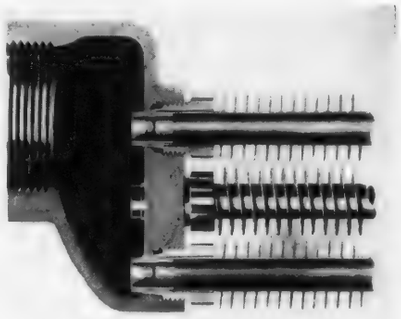
Twinfan Radiator



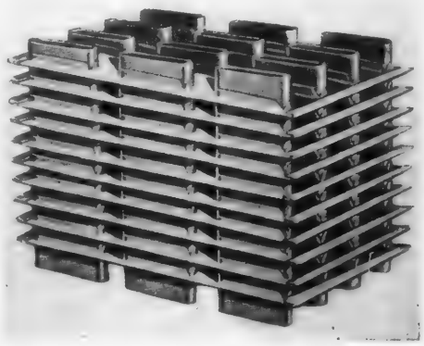
(Above) Removable Feature of York Super-Fin Coils

(Below) Thermal Unit Heating Surface Is Integrally Cast of Aluminum Alloy





Method of Connecting Tubes to Header of Twinfan Radiator by Means of Screwed Ground Joints

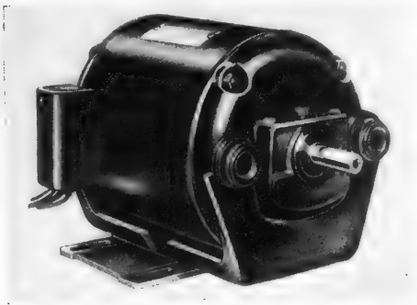


Young Heating Surface

New Apparatus and Appliances

Wagner Rubber-Mounted Motors

A motor known as type RAR, especially designed for homes, schools and churches where an exceptionally quiet motor is desired, has been announced by the Wagner Electric Corp., St. Louis, Mo. Rubber is used to absorb the vibration, bushings of this material being used between the saddle base and the motor.



Wagner Rubber Mounted Motor

The motor is of the brush lifting type, the brushes being lifted off the commutator as soon as the rotor attains operating speed. This feature insures quietness in operation.

Brownell Automatic Underfeed Stoker

An automatic underfeed stoker is announced by the Brownell Co., Dayton, O. It is designed to deliver coal from a hopper automatically in proportion to the load by means of a feed screw to the furnace retort. As the fuel rises it passes tuyere openings through which air is supplied by a blower to mix with the volatile gases. As the coke, or fixed carbon, is fed upward and outward it gradually burns, leaving ash and clinker on side dead-plates, where they can be removed periodically through doors provided for the purpose.

Dual control of fuel and air is featured. Mechanism regulating the rate of coal feed also is designed to adjust the air-supply damper and automatically maintain fuel and air supply in proper relation for efficient combustion. Fuel or air supply may be adjusted independently by hand, if desired. Either a motor or steam turbine furnishes power for driving the stoker. A bronze connecting rod actuating a steel pawl and steel ratchet gear drives the steel coal-feeding screw. Ball bearings support all high speed parts, and lubrication is by oil bath. Protection from damage due to foreign matter in the fuel is afforded by a safety shearing-pin. Operating under the control of the pressure or water-temperature regulator is a switch which starts and stops the stoker automatically. Models are furnished with capacities for handling 4500, 7000, 10,000, and 15,000 sq. ft. of steam radiation.

PeerVent De Luxe Unit Ventilators

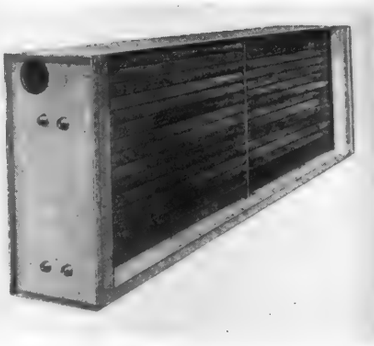
A de luxe unit ventilator, with attractive panelling of furniture steel, has been put on the market by the Peerless Unit Ventilating Co., Bridgeport, Conn. Cool air is drawn in through the grille at the bottom of the unit, a damper controlling the volume. Two multiblade drums, powered by a low-speed electric motor, drive the air upward through a copper steam radiator which is placed just under the top of the cabinet. The top, of course, is grilled, through which the warm air is discharged. Cabinet ends and front door are removable without the use of tools. When all sides are in place, the unit is leakproof.

PeerVent De Luxe Heating and Ventilating Unit with Front Cover Removed

Arcoblast Heating Surface

A light-weight indirect blast heating surface for central fan and plenum chamber work has been announced by the American Radiator Co., New York. This surface is known as Arcoblast encased section and is designed on the same principles used in the Arcoblast heater for unit heaters.

The heater is composed of staggered rows of copper tubes expanded into cast-iron headers, on the opposite side of which are registering tapped openings through which the tubes are expanded. After the expanding operation the holes are closed with counter-sunk plugs. The ¾ in. tubes are wound with extended copper surface—metallically attached—with six turns per lineal inch. The over-all diameter is 1½ in. The tubes are extended into header and ample strength for pressures from 5 lbs. to 200 lbs. is assured. Casings are made of black iron and then galvanized.

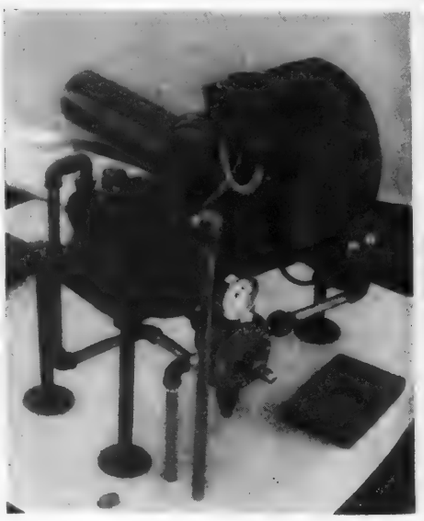


Arcoblast Encased Heater

Encased Arcoblast is recommended whenever building construction will not permit the use of cast-iron Vento surface.

Gearhart Oil Burners

A line of manual, or semi-automatic, and full-automatic oil burners has been placed on the market by the Gearhart Oil Burner Co., Fresno, Calif. The former are of the rotary, centrifugal, vaporizing type with continuous flame and mechanical draft. A no-voltage release switch, solenoid safety oil valve, safety bucket switch, oil metering needle valve and gas pilot ignition are standard



Gearhart Oil Burner

equipment on this type. The automatic type is supplied with all-electric controls, including a Lockswitch. Oil consumption ranges from 2 to 6 gal. per hr., with capacities ranging from 500 to 4000 sq. ft. of steam radiation. The capacity of the burner shown in the illustration is 4000 sq. ft.

Jacketed Magazine Feed Boiler

A line of jacketed magazine feed boilers has been announced by the Spencer Heater Co., Williamsport, Pa. The "J" type heater is a cast-iron sectional type and can be supplied with or without the enamel steel jacket in color. It is made in three sizes, with steam radiation capacities ranging from 175 to 375 sq. ft.

The L-1 type heater can be supplied in 4 sizes with a steel jacket in color

Modern Jacketed Magazine Feed Boiler

and has capacities ranging from 390 to 750 sq. ft. of steam radiation.

For larger homes and buildings, the L-2 type heater can be supplied with or without the enamel steel jacket in color, and is made in 6 sizes. The capacity of this boiler ranges from 550 to 1425 sq. ft. of steam radiation.

Direct-Current Cam Switch

A direct-current cam switch, developed to satisfy the needs of central stations for a device to control auxiliaries such as pumps and blowers, has been announced by the General Electric Co., Schenectady, N. Y. This switch also can be used for similar non-reversing applications where the current inrush or starting torque is not severe, or the operations are not frequent.

Designated as CR-3108, the new switch is available in two forms.

Heating Surface of Niagara Unit Heater

Niagara Fan Heater

A line of floor-mounted unit heaters has been announced by the Niagara Blower Co., Buffalo, N. Y. The heating surface is constructed of standard ¾-in. steel pipe with an aluminum fin inserted in a spiral groove around the exterior of the pipe. Each end of the hairpin-shaped tubes is welded to the header tube plate. The header covers are of pressed steel and also welded to the header tube plates.

After assembly, the coil is tested at 1000 lbs. hydrostatic pressure. The heating surface is guaranteed for working steam pressure of 350 lbs. and temperature at 500° F.

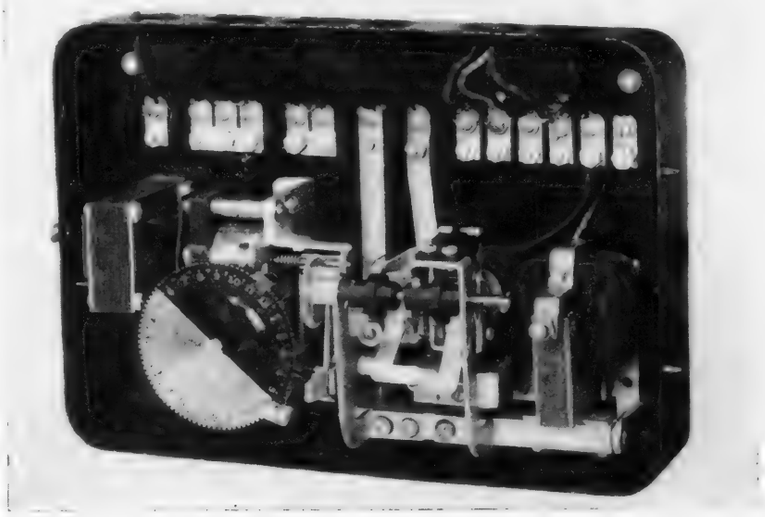
The heaters are supplied in two types, one designated as narrow units, the other as standard width units. The narrow unit can be supplied in six sizes with capacities ranging from 370 to 1640 sq. ft. of equivalent direct radiation. The standard width units have capacities ranging from 790 to 3910 sq. ft. of equivalent radiation.

Penn Heat Control

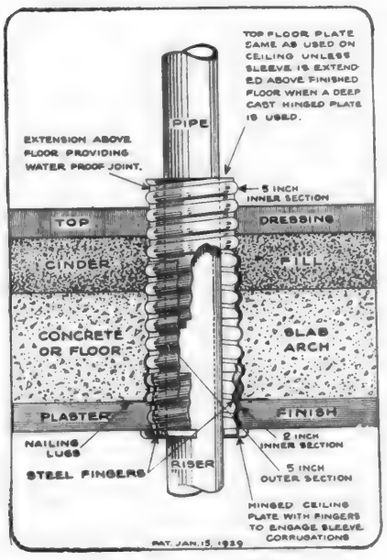
In cooperation with the General Electric Company, the Penn Heat Control Corp., Philadelphia, Pa., has developed a control equipment for domestic oil burners. When used with hot or cold refractories, an open ignition line, water in the line, delayed ignition, water in the oil, no head on the pump, interruption of power and other irregularities of operation, this device prevents explosions or flare-backs by limiting the amount of oil in the firepot during any given period of time.

The apparatus consists of three elements: the thermostat, control unit and ignition cut-off. The function of the thermostat is to transmit the call for heat or shut down. Interposed between the thermostat and the burner, the control unit translates the motions of the thermostat into burner operations. This device includes the necessary parts to start the burner only under safe conditions and to shut down the burner when required by the thermostat or safety devices.

Mounted in the boiler or furnace firebox, near the oil flame, the ignition cut-off is a thermostatic device separate from the control unit. Its purpose is to indicate when the fuel has been ignited and also to indicate flame failure. It operates from 1 to 5 seconds after the presence or absence of flame in the firebox.



Penn Control Unit for Oil Burner


TOP FLOOR PLATE SAME AS USED ON CEILING UNLESS SLEEVE IS EXTENDED ABOVE FINISHED FLOOR WHEN A DEEP CAST HINGED PLATE IS USED.
EXTENSION ABOVE FLOOR PROVIDING WATER PROOF JOINT.
PIPE
5 INCH INNER SECTION
TOP DRESSING
CINDER FILL
CONCRETE OR FLOOR
SLAB ARCH
PLASTER
FINISH
NAILING LUGS
STEEL FINGERS
RISER
2 INCH INNER SECTION
5 INCH OUTER SECTION
HINGED CEILING PLATE WITH FINGERS TO ENGAGE SLEEVE CORRUGATIONS
PAT. JAN. 15, 1929

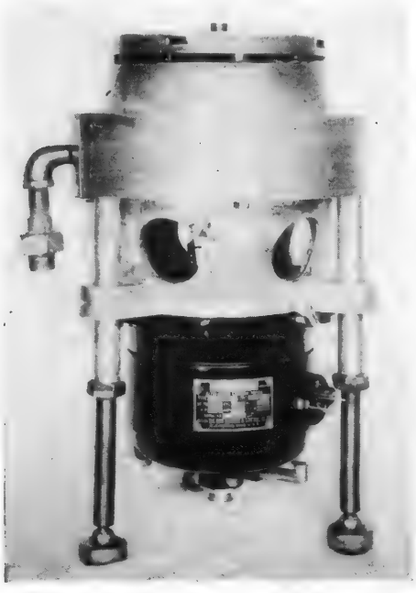
Knowles Super-Sleeve

Knowles Super-Sleeve

An extensible form for providing fixed holes in concrete and other types of floors and walls for all kinds of piping, known as the Super-Sleeve, has been announced by the Knowles Pipe Sleeve Co., 202 Franklin St., New York. This device is a spiral, corrugated, galvanized-iron sleeve made in outer and inner sections 5 in. long to which other sections can be joined, thus providing pipe sleeves to be used through flooring and walls of any thickness.

The outer section is provided with strap lugs for nailing the sleeve onto the form so that the sleeve is held in place before and while the concrete slab or arch is poured. By the addition of an inner 5 in. section, the sleeve may be extended after the slab is poured to provide for additional cinder fill, top cement dressing or wood flooring. The length of the sleeves can be varied during each stage of construction.

When installed with an extension above the finished floor, this device provides a means to prevent water passing through the floor around the pipe. Its use saves time and labor in providing and setting special sizes made to order for each job, and eliminates clipping the sleeve to length. One of the distinctive features of the device is the hinged plates which cover the ends of the sleeves and are fitted tightly and permanently flush to the ceilings, floors and walls. They are made to fit all sizes of pipe up to 5 in.



Victory Rotary Type Oil Burner

Thermostatic Valve for Storage Tanks

A thermostatic valve for the control of the temperature of water in a storage tank, known as the Kenney Thermo-Valve, has been announced by the Flannery Mfg. Co., Pittsburgh, Pa. When the water has been heated to any predetermined degree the valve automatically operates and shuts off the supply of gas under the heating coils and prevents any flash back of the burner. When the water temperature falls below the point desired, the valve then permits the full flow of gas to be supplied to the burners which are ignited by the pilot light.

The valve is of the snap-action type and is so designed that a disc slide is rubbed forward and backward each time the valve operates so that the valve seat is kept clean.

Victory Oil Burner

A vertical, rotary-type oil burner, named the Victory, weighing 39 lbs. has been introduced by International Burners Corp., 225 West 34th St., New York. It is equipped with a special Minneapolis-Honeywell relay, Pyrostat, boiler control, and thermostat. An Arco oil valve strainer is used, and the relay, oil valve and strainer, and gas valve are mounted on the control stand and wired at the factory.

A 1750 R.P.M., 1/12 H.P. motor with a maximum current consumption of 100 watts per hour is directly connected to the burner shaft with a Lovejoy universal coupler. The motor can be supplied either for alternating or direct current. An expanding gas pilot is used for the ignition.

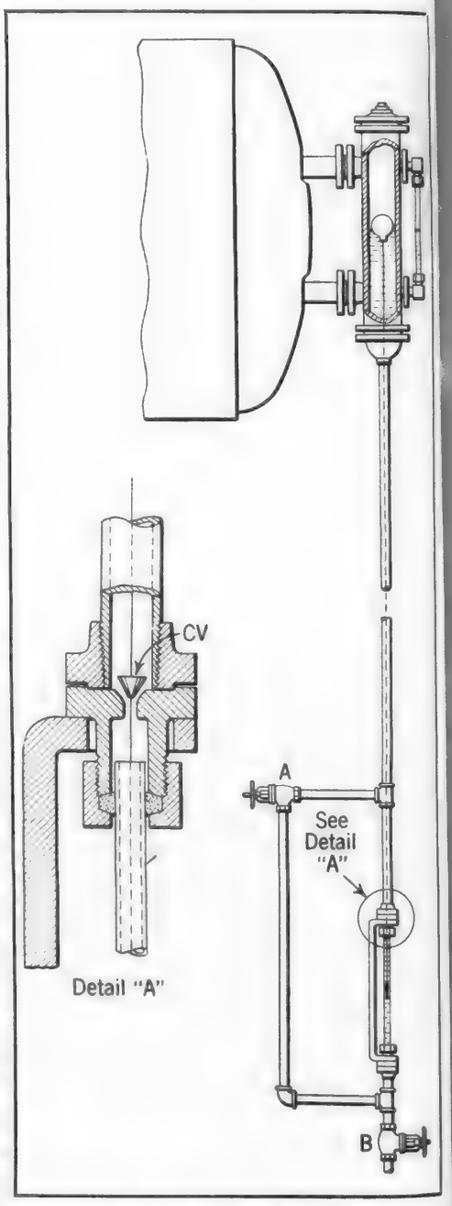
The Victory is suitable for use in sizes ranging from 19-in. round boilers to 5000 sq. ft. section boilers and consumes from ½ to 8 gal. of 34° to 36° Baumé distillate per hour.

C. E. Water Level Indicator

A device to permit the placing of water-level indicators at any desirable location or elevation, known as the C. E. water-level indicator, has been announced by the Combustion Engineering Corp., 200 Madison Ave., New York.

The usual water column is connected to the boiler drum. Inside the column is a non-corrosive float suitable for the maximum working pressure for which the boiler is designed. The float is direct-connected to an indicator in the water glass by means of a non-corrosive wire extending down through a small pipe.

Adjustments are made so that when the float in the water column on the drum is in its normal position, the indicator within the lower glass is also in the center of the glass, its normal level position.



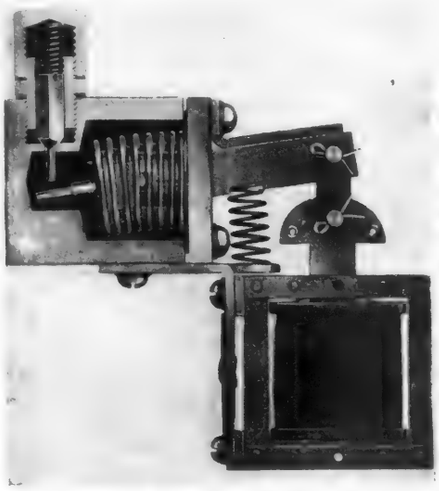
Water Level Indicator

G-E Solenoid-Operated Valves

Solenoid-operated valves for the remote control of liquids and gases under pressure have been announced by the General Electric Co., Schenectady, N. Y. These valves, which are available in both ¼ and ½ in. sizes, are of the unbalanced type, either normally open or normally closed, and are supported directly by the pipe line in which they are connected.

No stuffing glands or packings are used and there is no possibility of leakage between the pressure chamber in the valve and the atmosphere, since a bellows transmits the motion of the solenoid armature to the valve stem.

The ½ in. valve can be supplied in 110 to 550 volts for alternating or direct current and the ½ in. valve in 110 to 550 volts for alternating current only.

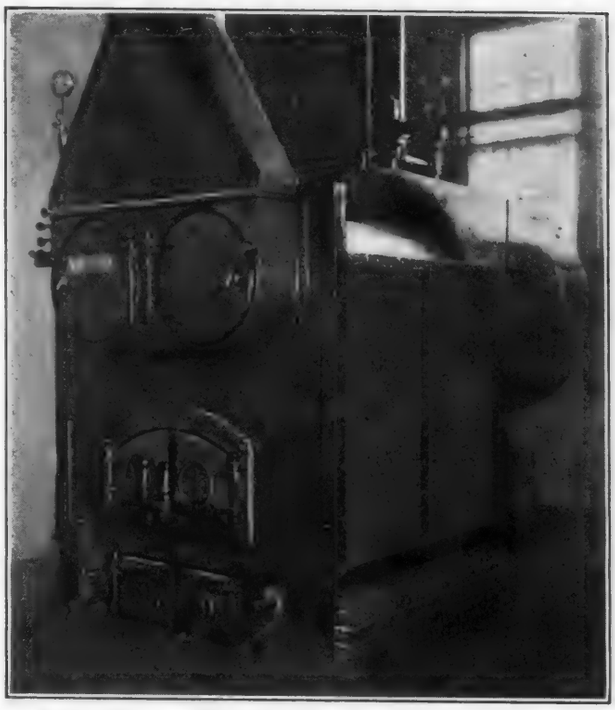


G-E Solenoid Valve

The maximum pressure which can be carried is 80 lbs. and the maximum temperature 212° F. The valves are known as No. CR9505-A1 and B1.

Oil Burner for Warm-Air Furnace

A burner designed along the same lines as the former Junior and known as the DO-2 has been announced by Preferred Oil Burners, Inc., Peoria, Ill. This burner, designed especially for warm-air furnace installation, is so designed as to avoid a positive pressure from being set up inside the combustion chamber, thus making it less liable for the gases and combustion to reach into the air chamber. The burner is produced with straight electric ignition only. The motor, pump, drain back trap, control box and vacuum tank are identical with the Junior and other D-type burners. It is painted a dark brown color and rated at 600 sq. ft. of steam radiation or 750 sq. in. of warm-air leader pipe.



Keeler Double-Duty Boiler

Keeler Double-Duty Boiler

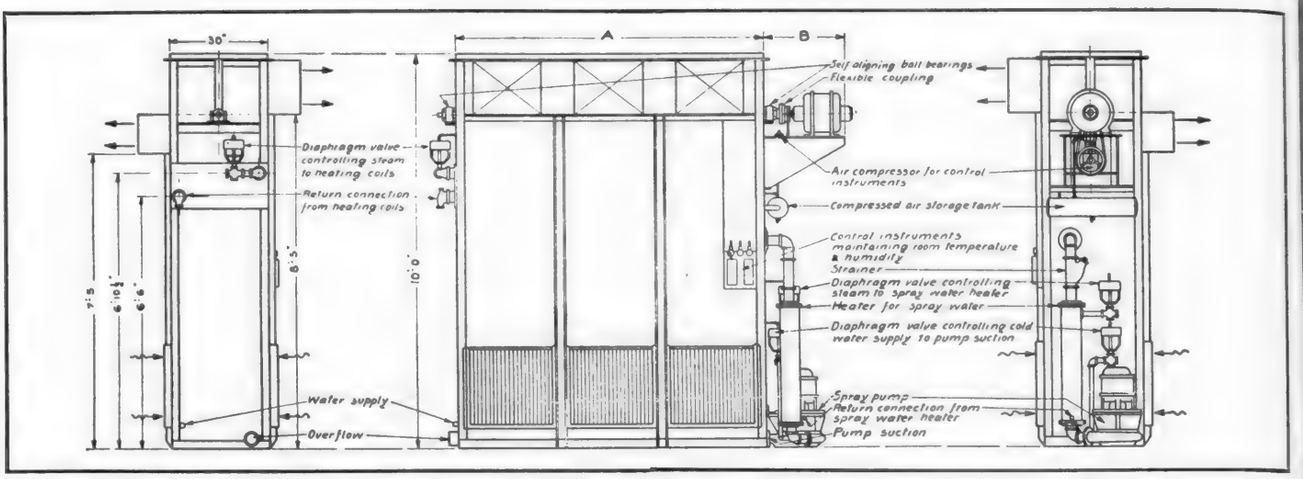
Designed as a combination power and steam heating boiler, the new Keeler double-duty boiler is announced by the Keeler Co., Williamsport, Pa. Large secondary surface makes it adaptable for coal, gas or oil.

Gases from the fire pass through the large drum of the boiler to a rear chamber, and return through pipes slightly reduced in area. These return tubes extend forward from the main boiler in two circular projections which are directly above the fuel bed. A fire-brick wall separates the fuel from the fire tubes, so that the only portion of the main drum exposed to fire is at the entrance to the tubes. Steam space is provided in the main section and projections. Connection is made at the top of the large drum through an internal separator.

Since the main part of the boiler is outside the combustion chamber it is easily accessible for cleaning and repairs. The elliptical full-size manhole is of the double-bolt and yoke type.

The blowoff is located in the bottom of the large shell. Efficient sludge removal and consequent lowering of scale formation are claimed since this portion of the shell is not heated in any way from the fuel bed.

Oil Burner for Warm-Air Furnace



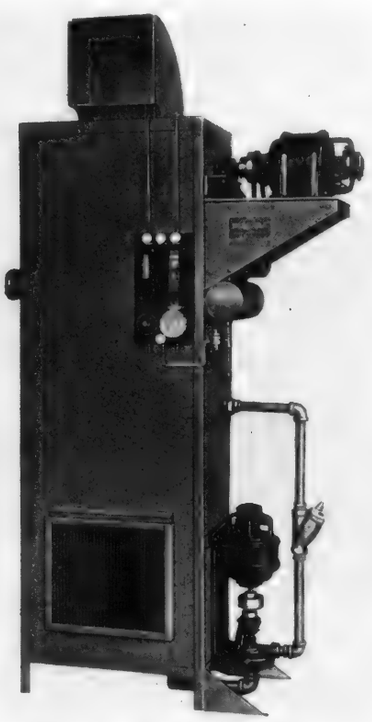
Elevation of Niagara Unit Air Conditioner

Niagara Unit Air Conditioner

A unit air conditioner has been announced by the Niagara Blower Co., Buffalo, N. Y. The unit is shipped assembled ready for installation by connecting to water supply, steam lines and electric current. The structure is of galvanized plates reinforced by heavy angles, and is water-tight. Special non-corrosive materials can be used if required.

Non-clogging spray nozzles are used. The water heater is a straight tube pipe with removable end plate, placed on the side of the unit casing. Pressure from the water at the spray nozzle is supplied by a motor-driven pump and the water is recirculated so that in the case of humidification only the water loss by evaporation is consumed. Niagara tube-fin coils are pipe welded to the headers and the fins permanently knurled on the pipe. A specially designed Niagara centrifugal fan is used.

Temperature and humidity controls are mounted on a single panel with tube connections to the control point. These units can be supplied in 12 sizes, with capacities ranging from 3250 to 12,000 cu. ft. of air per minute, saturated at 60°. The equivalent capacities in direct radiation of these units range from 830 to 2800 sq. ft.



Niagara Unit Air Conditioner

Johns-Manville Announces Latest Product

Transite seamless pipe made of asbestos fiber and Portland cement will be produced on a quantity production basis shortly by the Johns-Manville Corp., 292 Madison Ave., New York. This company has recently acquired from Italy, the United States and Canadian rights for the manufacture of this pipe, which is a dense, close-grained material, readily cut, tapped or threaded.

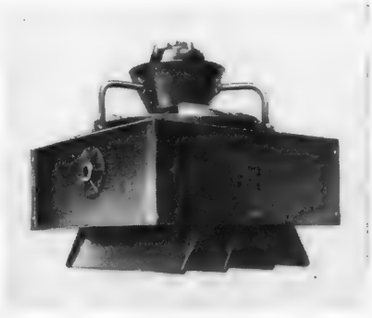
The weight of Transite pipe is from 50% to 65% less than cast-iron or steel pipe and is entirely free from electrolysis and soil corrosion. The new product will be manufactured both as pressure pipe for carrying various liquids and solutions that must be distributed under pressure, and flue pipe for venting house-heating boilers, automatic water heaters, etc., and for drainage.

Specially designed machinery for the manufacture of this pipe is now being built in Italy and two complete units will be installed at the Waukegan, Ill., plant of the Johns-Manville Corporation.

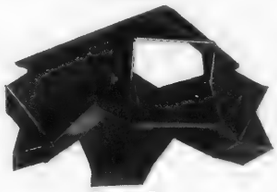
Brownell Fuel-Savr Boiler

Boilers made in one solid unit of heavy gauge steel, electrically-welded at every point, are now being manufactured for small homes by the Brownell Co., Dayton, O. Compactness is a feature of this type of construction. Fuel-Savr boilers can be furnished with Brownell submerged-coil domestic water heaters, in the form of copper coils submerged in the water jacket. Because the coils are located in the water jacket, hot water can be obtained in summer by keeping a low fire in the boiler sufficient to heat the water but not the building. Two widths of boiler are furnished, 27-in. and 30-in. The smaller type has a capacity of 400 sq. ft. of steam radiation and the larger, a capacity of 600 sq. ft. of steam radiation.

Brownell Vertical Steel Boiler



Design 1



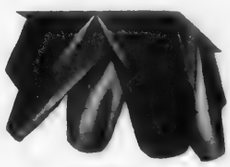
Design 5

Design 2

Design 3

Design 4

Design 6



Design 7

Design 8

Standard Discharges for Wing Unit Heaters

Discharge Outlets for Unit Heaters Must Meet Varying Conditions

As is well known, distribution of air from unit heaters depends to an important extent on the design of the discharge outlets. In the Wing featherweight unit heater, recently placed on the market by L. J. Wing Mfg. Co., 154 West 14th St., New York, eight designs of discharge outlets have been provided.

Design 1 is intended to be used when heaters are installed at heads as low as 14 ft. for the smallest size and approximately 25 ft. for the largest, and where the area to be covered by one heater forms an oblong. When the area to be covered is long and narrow, the discharges shown in Designs 2, 3, and 4 are utilized. The same arrangement is followed when heaters are placed appreciably lower than usual.

When the area is practically square, and the heaters are placed relatively low, the discharge outlet shown in Design 5 has given satisfactory results. This design, it will be noted, has four points of discharge each diagonally from the corner of the heater. Design 6 is for use under similar conditions, but the best distribution is obtained by discharging four air columns parallel with the sides of the heater. When the heaters are placed at heights not greater than 18 ft. from the floor for the smaller size and approximately 30 ft. for the larger sizes and when the areas to be covered are practically square, Design 7 is recommended. Finally, Design 8 is designed for areas oblong in form.

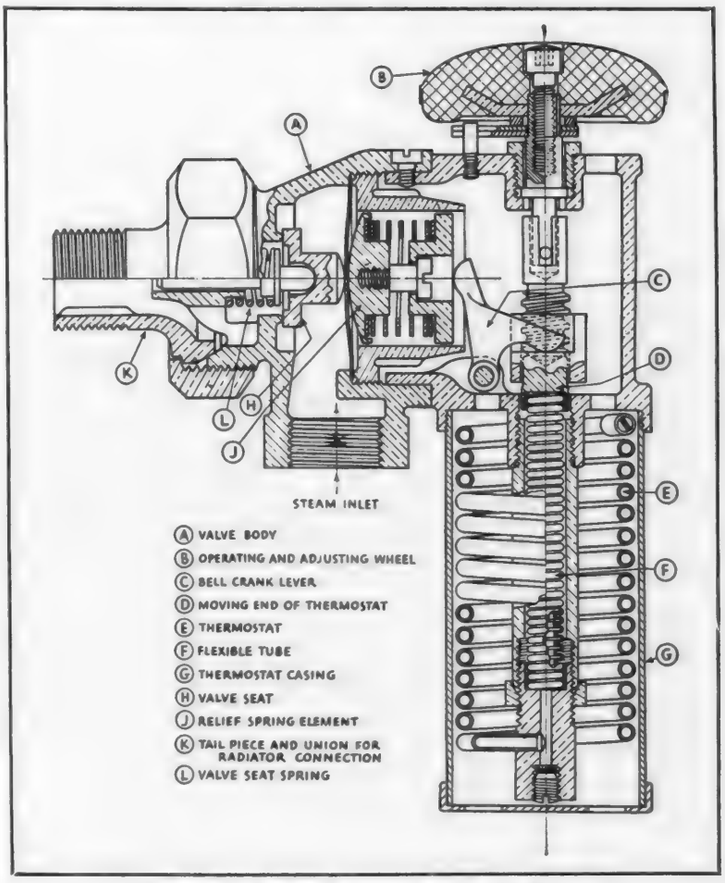
All the discharge outlets have adjustable diffusers, which permit the setting of the angle of discharge to suit the height at which the heaters are placed and the extent of the area to be covered. Units are available utilizing 1.57 to 18.8 B.H.P., supplying from 1150 to 9000 cu. ft. of air per minute or an equivalent B.T.U. per hour of from 52,000 to 623,000.

Direct Control Valve

A direct control valve, a thermostatically-operated, quick opening, packless radiator valve which controls the amount of steam supplied to each radiator to which it is attached, is being made by the Direct Control Valve Co., Chicago, Ill. The valve is a complete self-contained unit and requires no outside power. It is guaranteed to maintain a temperature of the room to within 1° of the required point. The degree of temperature at which the room is to be maintained can be changed by turning the valve wheel to 8° above or below the point at which the valve is originally set. It also is made with a key or lock shield so that it can be adjusted only by the person holding the operator's key. The latter type is particularly suitable to schools and institutions.

Manual operation of the valve without the thermostat is possible, and is an advantage in new buildings, where it can be operated as a hand valve until the building is ready for occupancy.

A hydraulic thermostat operates the valve, the thermostatic element being exposed to the air, which can enter the metal cylinder through perforations in the bottom of the casing.



Section of Direct Control Radiator Valve

New Trade Publications

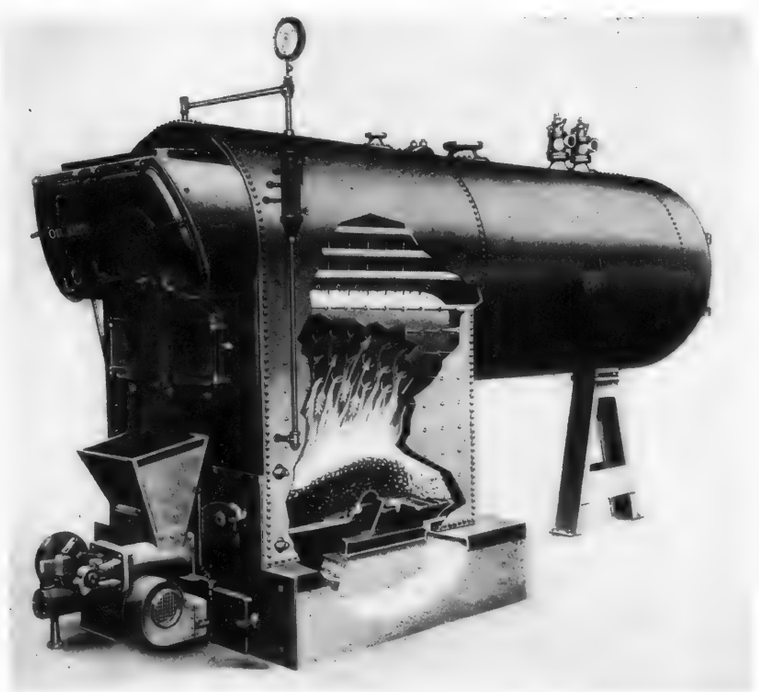
Adjustable Varying-Speed Motors, Type BSR, are described in bulletin GEA-98A, issued by the General Electric Co., Schenectady, N. Y. These motors have a 2½ to 1 speed adjustment. Type BSR is a constant torque motor, so that the horsepower output varies directly with the speed. When the motor is operating against a constant torque of 75% of normal rating, a reduction in speed of 2½ to 1 can be obtained by shifting the brush yoke. Operating against 100% normal torque a speed reduction of 4 to 1 can be obtained. The maximum torque developed by the BSR motor is 300% to 350% of the full load torque. These motors can be obtained in either reversible or non-reversible type for either 110 or 220-volt current. They are designed for a 40° C. continuous-duty rise.

Loaded with Profits is the statement made on a broadside issued by the Bryan Steam Corp., Peru, Ind. Shipments by this company for the month of January, 1929, were greater than the total sales for the entire year of 1925. Twenty boilers were shipped in 1927, 25 carloads in 1928, and 100 carloads are expected to be shipped in 1929.

Stoker-Unit Boilers are described in a catalog received from the Oil City Boiler Works, Oil City, Pa. One of the special features of this boiler is the design of the water leg portion of the firebox so that a stoker can be accommodated, the mud-ring being well below the combustion zone. Capacities range from 75 to 300 boiler H.P. Inasmuch as the boiler is equipped with a stoker, automatic control is possible.

Enterprise Rotary Oil Burners are described in a catalog of the Enterprise Oil Burner Co., 2902 19th St., San Francisco, Calif. It contains a sectional view of an Enterprise oil burner with parts, numbers and names. A method of comparing costs of oil, coal wood, gas and central station heating is given so that the dealer can estimate fuel costs in his locality, regardless of the price of fuel. Illustrations and descriptions of each of the different parts of the Enterprise burner are included, and numerous illustrations show actual installations of these devices. Size 8½ in. x 11 in. Pp. 18.

The Brownell Master Boiler is described in catalog A-64 of the Brownell Co., Welded Steel Boiler Division, Dayton, O. The Master boiler is of welded steel construction and is a horizontal type for heating or incineration. Each boiler is guaranteed for a period of one year from the date of installation and the company agrees to replace, without charge during that period, any part found defective through imperfections in workmanship or material. A guarantee is also given with each boiler that it will carry its full rated capacity in standing cast-iron radiation or its equivalent.



Stoker-Unit Steel Boiler

Joint Welding the Underground Steam Distribution System Supplying the B. & M. North Station, Boston

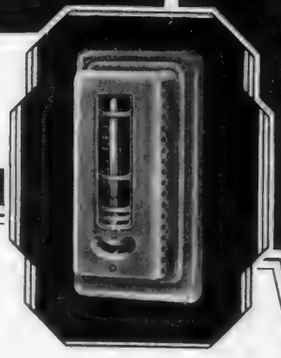
The Underground Steam Distribution System supplying the new Boston & Main North Station, the Boston Garden, the hotel and mart adjoining, and the many warehouses and office buildings in the vicinity, is described in an interesting folder issued by the Underground Steam Construction Co., 75 Pitts St., Boston, Mass. The capacity of the 14-in. main installed is 200,000 lbs. of steam per hour.

The system was completely welded throughout except at the manholes. Especially constructed cast-iron housings with Leadite joints produced a waterproofing encasement and prevented distortion which might be caused by the ever increasing street loads. This company makes a specialty of steam main constructions.

McKeesport Radiation is the title of a booklet prepared by the Columbia Radiator Co., McKeesport, Pa. Capacity and dimension tables of the 3, 4, 5, 6 and 7-tube radiators and wall radiators made by this company are presented.

Armstrong's Cork Machinery Isolation is the title of a folder received from the Armstrong Cork and Insulation Co., Pittsburgh, Pa. This material is made in boards 4 in. wide, 30 in. long, and 1, 1½, 2, 3, 4, 5 and 6 in. thick of varying densities to meet the different service conditions encountered. The densities range from 1.10 lbs. per board foot to 1.55 lbs. per board foot. A list of the building and plants where this material can be used is given, together with a list of the machines under which it can be used. A chart shows the deformation of different loads of the various densities of Armstrong's cork machinery isolation. On the last sheet are shown a number of detailed drawings of typical installations where this material is used.

Owner: CANADIAN PACIFIC RAILWAY CO., Ltd.
Architect: ROSS & MACDONALD, Montreal, Canada.
Consulting Engineer: WALTER J. ARMSTRONG, Montreal.
Heating Contractor: JAMES BALLANTYNE, Ltd., Montreal.



Largest and one of the Finest Hotels in the British Empire is Equipped with Powers Control

The temperature of the air in the Dining Rooms, Ballrooms, Convention Floors, and other public spaces in the imposing structure shown above, is regulated by Powers Control.

Simplicity of construction, durability and long service without repairs, are some of the features which caused the selection of Powers Control for this purpose. It costs more. It's worth more!

The Powers Vapor Disc Thermostat

Does not need to be adjusted or overhauled annually. Often gives 15 to 20 years of accurate control without repairs of any kind.

THE POWERS REGULATOR COMPANY

35 Years of Specialization in Automatic Temperature Control

CHICAGO: 2718 Greenview Ave. Offices in 35 Other Cities NEW YORK: 137 East 46th Street

The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

POWERS

Photograph Showing Path of Dust Particles in a Bent Air Flow

Man's Conquest of The Air is the title of an interesting booklet describing the theory of air currents. Stig G. Sylvan, research engineer, Midwest Air Filters, Inc., and Prof. Samuel E. Dibble, Carnegie Institute of Technology, are the authors. Midwest Air Filters, Inc., Bradford, Pa., is the publisher.

Early laboratory experiments in the elimination of dust are described, as are the theoretical and practical applications of the "centrifugation" principle, and the theory of the Wittemeier or semi-dry air filters. How the velocity of moving particles influences the cleaning action is explained, as is the theory of the perfect filter medium. Experimental verification of the theory is taken up in a test report which is accompanied by a photograph of an automatic filter incorporating vertically-placed sinuous filter plates. Size 5½ in. by 7¾ in. Pp. 20.

How To Determine Sizes on Outside Type B & G Water Heaters is the title of a useful data sheet published by the Bell & Gossett Co., B & G Division, 3000 Wallace St., Chicago, Ill. Sizes of storage tanks and of B & G heaters are given in the table for various sizes and types of buildings, based on boiler water temperatures of not less than 180° F. Supplementary data indicate the capacity requirements of factories, country clubs, office buildings, restaurants and public garages. Other data include additional capacity to provide if oil heat is used, and the proper allowance to be made for radiation tax on the boiler, as well as the amount of water radiation the heater will handle.

Mercoid Controls for heating equipment are described in the latest catalog of the Mercoid Corp., 564 West Adams Street, Chicago, Ill. Thermostat pressure controls, immersion type controls for water boilers, Risertherms and Pyratherms are described and illustrated in detail. Considerable space is devoted to special controls for oil-burning systems, such as the Interlock, the Visaflame safety control and combination panel units. Mercoid ignition controls and solenoid valves, as well as low-water and pressure cut-outs, also are taken up. Several pages of typical Mercoid wiring diagrams are presented. Size 8½ in. x 11 in. Pp. 32.

Comet Unit Heaters are brought to the attention of the industry in Catalog No. 105, issued by the New York Blower Co., 32nd St. and Shields Ave., Chicago. Heavy-gauge, welded, molybdenum Toncan steel oval tubes, with large steam area and heat-dissipating surfaces, are used in the construction of the heating elements. Photographs show various industrial and building installations of Comet heaters. In one case a heater is

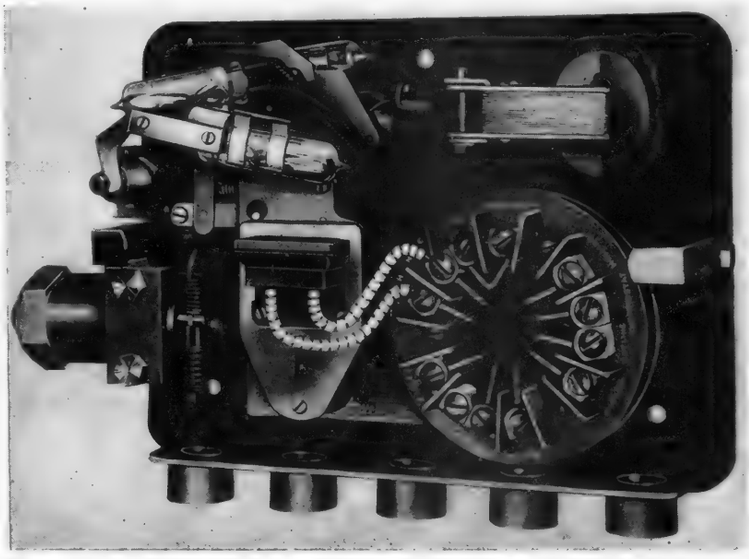
Smallest Comet Unit Heater with Recirculating Connection for Heating Vestibule of an Office Building

equipped with a recirculating box for heating a greasing pit. Tables include operating data on four types of Comet heaters, with capacities of 800, 1800, 2400, 6000 C.F.M. Size 8½ in. by 11 in. Pp. 24.

Copper-Bearing Steel Pipe is the title of the most recent *National Bulletin*, issued by the National Tube Co., Pittsburgh, Pa. This publication compares the corrosion-resisting powers of copper-bearing steel pipe and similar non-copper-bearing pipe.

Tests carried out by the American Society for Testing Materials are the bases for the claims made by the National Tube Company for copper-bearing steel pipe. These tests, commenced in 1915, and in some cases still incomplete, were conducted independently in several localities in order to approximate actual working conditions as nearly as possible. Experiments at Pittsburgh were carried on in a typical industrial atmosphere; those in Fort Sheridan, Ill., encountered conditions such as are faced in rural communities, and the tests at Annapolis, Md., were calculated to demonstrate the resistance to salt air and sea-front corrosion. In each of these localities 16- and 22-gauge uncoated sheets were exposed on frames.

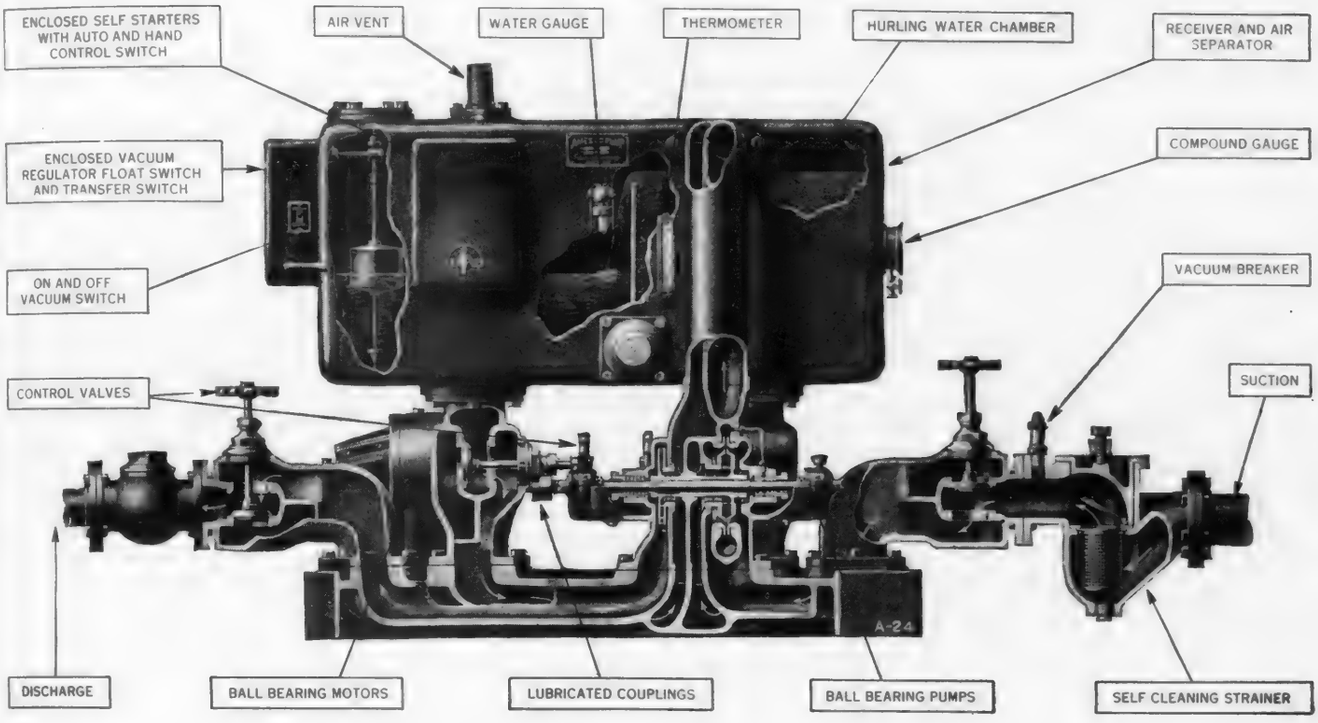
The rate of failure was found to be far greater in Pittsburgh than elsewhere, but the order in which the various materials collapsed was substantially the same in all three places. Tables in the bulletin show that at Pittsburgh, where the conditions were most unfavorable, the average life of the 22-gauge sheets (open-hearth steel, Bessemer steel, and open-hearth pure iron) was 18.9 months while the same sheets containing copper had an average life of 57.3 months. Sixteen-gauge sheets of the same type similarly exposed showed an average life for non-copper-bearing steel of 46.9 months, while sheets containing copper were all intact when the tests at Pittsburgh were discontinued at the end of 75 months.



Mercoid Interlock, Automatic Control for Oil-Burner Equipment

By all means *COMPARE!*

THE AMES VACUUM HEATING PUMP



MAKE THE comparison complete, based solely on the heating system problem and the ability of the pump to solve that problem.

Comparisons such as this reveal the value of the AMES Pump and emphasize the fact that it is

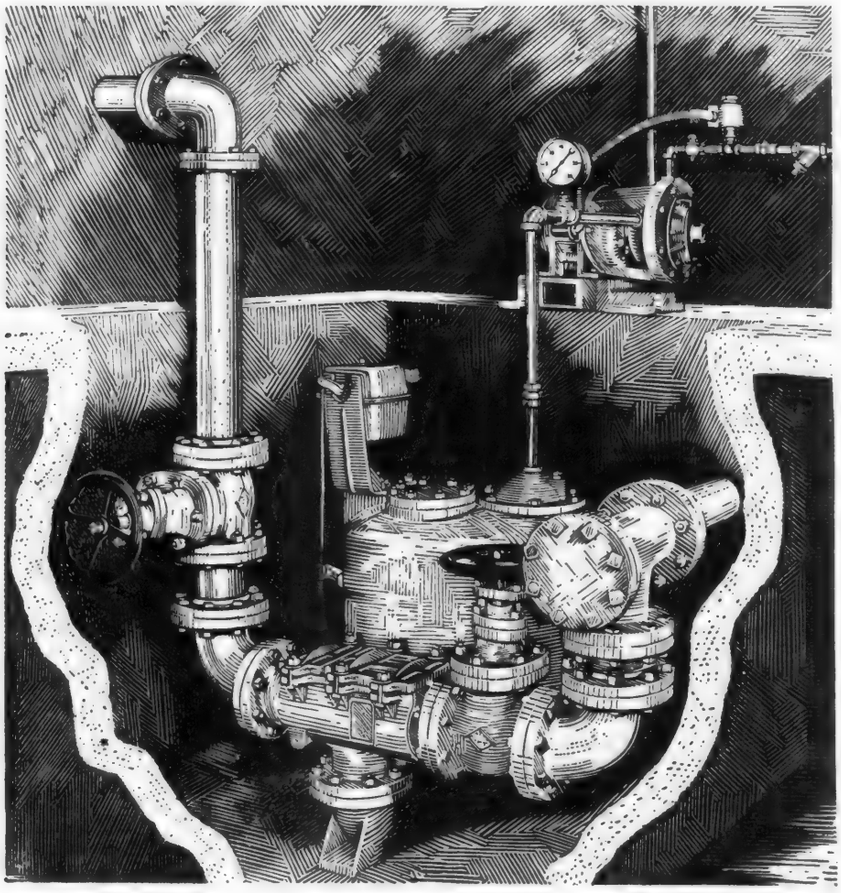
The Pump of Performance

AMES PUMP COMPANY, INC.

30 Church Street • New York City

***Affiliated with* AMERICAN LOCOMOTIVE COMPANY**

PERFORMANCE DISTINCTIVELY DIFFERENT



This small Jennings Ejector has a capacity of 30 g. p. m., sufficient to serve five toilets.

Other sizes are furnished in capacities ranging from 50 to 1500 g. p. m. Heads up to 50 ft. Write for Bulletin 67.

Handles sewage

...up to 30 g. p. m.

For raising unscreened sewage from basements below street sewer level . . . handling waste from toilets, laundries or dish-washing machines...wherever the quantity runs no greater than 30 g.p.m., this small Jennings Ejector can be used to advantage.

Following the same simplified design as the larger Jennings units, it operates on the pneumatic principle without employing air valves, air storage tanks, or reciprocating compressors. It cannot clog because no vital moving parts come in contact with the sewage. Anything that will pass thru the extra large inlet, 4 inches in diameter, is readily handled. Screens are avoided. The Nash Hytor Compressor operates only when sewage is being moved. A smaller motor, with less h.p., is required than is needed for a centrifugal sewage pump of the same capacity. Power consumption is small.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS—CONDENSATION PUMPS—COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES—STANDARD AND SUCTION CENTRIFUGAL PUMPS—HOUSE SERVICE PUMPS — SEWAGE EJECTORS—SUMP PUMPS—FLAT BOX PUMPS — MARINE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

Trade and Miscellaneous Notes

Coming Events

October 14-18, 1929. Eleventh annual convention of the American Gas Association at Atlantic City, N. J. Headquarters at Municipal Auditorium.

January 27-31, 1930. Annual meeting of the American Society of Heating and Ventilating Engineers, Philadelphia, Pa. Headquarters at the Benjamin Franklin Hotel.

January 27-31, 1930. International Heating and Ventilating Exposition at Philadelphia, Pa., at the Commercial Museum.

McDonnell & Miller Partnership Dissolved

The co-partnership subsisting between L. B. Miller and E. N. McDonnell, under the firm name of McDonnell and Miller, located at 400 North Michigan Ave., Chicago, Ill., and at 5936 Grand Central Terminal Bldg., New York, was dissolved by mutual consent on the 20th day of June, 1929. Mr. Miller has retired from the firm but Mr. McDonnell will continue the business under the old firm name.

The unfinished business and affairs of this late partnership will be attended to by E. N. McDonnell, who is authorized to collect, receive and receipt for all moneys, goods and properties due or accruing to the partnership. He also will discharge all obligations of the late partnership and perform all its unexecuted contracts.

Miscellaneous Notes

May building operations, as reported by the F. W. Dodge Corporation, show a 9% decline from the total for the preceding month and 12% from May, 1928. The total figures for the 37 states east of the Rocky mountains were $587,765,900. Analysis of this record shows that 33% of all construction was for residential buildings, 24% for public works and utilities, 15% for commercial buildings, 14% for industrial buildings, and 6% for educational buildings.

Contracts in New York State and Northern New Jersey amounted to $122,474,600, representing a decrease of 28% from last month's total and a decrease of 34% from the total for May, 1928. In the New England States figures amounted to $43,745,300, showing an increase of 7% over the total for the preceding month but a decrease of 28% from the total for May of last year.

In the Middle Atlantic States construction contracts amounted to $59,419,500, which showed a decrease of 44% from the total volume for April and a decline of 23% from the total for May, 1928. Contracts in the Pittsburgh district amounted to $71,472,100, representing a gain of 17% over the total for last month and 8% above the May, 1928, total.

The Central West reports contracts amounting to $199,136,400. These figures show an increase of 18% over the preceding month and 3% over the same month for last year. Figures in the Northwest amounted to $13,322,400, showing an increase of 21% over April and over 40% ahead of the total for May, 1928.

Contracts in the Southeastern States represent a total of $56,440,000, showing a decrease of 14% from the total for April of this year, but an increase of 13% over the total for May of last year. In Texas, contracts amounted to $21,755,600, representing an increase of 15% over the total for April, but a decrease of 19% from the total for May of last year.

National Association of Plumbing and Heating Salesmen held its fourth annual convention at the Bellevue-Stratford Hotel, Philadelphia, Pa., May 23-25. Russell G. Creviston, was the first speaker, and, after stressing the difficulty in pioneering any organization movement, he stated it was up to the salesmen to back up their code of ethics with deeds which will impress their employers. Statistics were quoted showing that 76% of the heating and plumbing contractors of Indianapolis and 82% in Chicago are opposed to having salesmen call on them, and that such a condition must be remedied. It was suggested that the association send to a thousand plumbers a questionnaire to bring out whether or not the present technique of selling is what it ought to be.

Among the other speakers were John Keene, New York Manager of the Plumbing and Heating Industries Bureau, who said that contractors want salesmen to give advice and counsel instead of being order takers, and it is up to these men to study conditions and point out the way to keep pace with the times. D. M. Robinson, president of the Plumbing and Heating Institute of Philadelphia, gave a talk on "What the Owners and Managers of Philadelphia Think of the Salesmen."

New officers elected were: President, W. W. Morgan, Philadelphia; vice-president, Harry Homer, New Jersey; treasurer, John H. Taylor, New York. Directors: Edward M. Robinson, New Jersey; Ferd Eidman, Oriole, and William B. Wagner, Eastern Pennsylvania. The position of secretary was left for selection by the incoming president. It was unanimously voted that retiring President Weber be elected President Emeritus, and Frank Moriarity, Atlanta Chapter, be appointed a regional vice-president. It was announced that the national office will be located at 925 Real Estate Trust Bldg., Philadelphia, Pa.

National Smoke Prevention Association, City Hall Square Bldg., Chicago, Ill., at its recent annual convention, elected the following officers: President, Glenn M. Jewell, Chief Smoke Inspector of Grand Rapids; first vice-president, Thomas D. Casserly, Weil-McLain Co., Michigan City, Ind.; second vice-president, George T. Beck of C. B. & Q. Railroad; secretary and treasurer, Frank A. Chambers, Chief Smoke Inspector of the City of Chicago. The next convention will be held in Newark, N. J., in June, 1930.

Plumbing and Heating Industries Bureau, announces the resignation of H. E. Hulseman, who has been a member of the staff since 1922. Mr. Hulseman has been in charge of membership, financing, catalog standardization, field service, and the classified directory of heating contractors and master plumbers. He also developed a removable binder for loose-leaf catalogs and obtained a patent on it. As there seems to be a real demand for the binder, he decided to devote his entire time to manufacturing and distributing it.

Gas and Electric Company of Baltimore, Md., industrial fuel department, announces that it has acquired the agency for the distribution of the Ideal gas boiler in Baltimore and vicinity.

Tri-Association Golf Tournament

Members of the Illinois Chapter of the American Society of Heating and Ventilating Engineers, Chicago Master Steamfitters Association and the Chicago Ventilating Contractors Employers Association, held a joint golf tournament and dinner at the Rolling Green Country Club, Chicago, June 20. Eighty players took part in the tournament and the course was obtained through T. H. Monaghan. The committee in charge of arrangements was: Chairman, John Howatt, John Haines, Louis Narowetz, C. W. Johnson, T. H. Monaghan, and Clint Beery.

Manufacturers' Notes

Carrier Engineering Corp., Newark, N. J., announces the establishment of a permanent engineering and sales office in the Buhl Building in Detroit, under the direction of Herbert Peacock, formerly assistant to the sales manager. Temporary engineering offices have been maintained during the past year in Detroit and also on previous occasions for the purpose of supervising the construction of extensive air conditioning, cooling and ventilating systems in that city.

Time-O-Stat Controls Co., Elkhart, Ind., announces an increase in personnel in line with the recent merger of the Absolute Con-Tac-Tor Corporation, Time-O-Stat Corporation, Leachwood Company and the Cramblet Engineering Corporation. Henry S. Wright, of Chicago, has been appointed vice-president and general manager of the new company and will have charge of the establishing and contacting of distributors of the company. J. C. Henry, connected with the Cities Service group for a number of years, will serve as contact man in the gas-burner division of the new company in the middle west and western states contacting public utilities.

Sundstrand Engineering Co., Rockford, Ill., has appointed the following new dealers: Edwards & Brown Co., Sioux City, Ia.; Blackhawk Electric Co., 121 Mifflin St., Madison, Wis.; Baraboo Sundstrand Oil Burner Co., Baraboo, Wis. Also the following distributors have been appointed: Champion Appliance Co., Janesville, Wis.; Hardin-Lavin Co., 131 West Pershing Rd., Chicago, Ill.

Peerless Unit Ventilation Co., Inc., Bridgeport, Conn., announces the resignation of H. W. Kingsbury as chief engineer of the company, effective June 15.

Consolidated Ashcroft Hancock Co., Inc., New York, has moved its general sales offices from New York to Bridgeport, Conn. The following changes have been made in personnel: G. A. Binz has been appointed assistant to the vice-president in direct charge of industrial sales research; W. P. Bradbury as general sales manager, and N. B. Carlton as western sales manager to be located at Chicago.

Gorton Heating Corp., 96 Liberty St., New York, has appointed Goggin & Mills as sales representative in the Chicago district, to be located at the new sales office at 5 South Wabash Ave.

Brown Instrument Co., Philadelphia, Pa., has appointed Arthur W. Gray as associate director of research. During the last 13 years Doctor Gray has served as director of physical research of the L. D. Caulk Company and vice-president and director of research of Dielectric Products, Inc.

Chicago Pump Co., Chicago, Ill., announces the following changes: Sidney Steiner, formerly of the home office organization has been transferred to the New York office; Ray Trethaway has joined the Detroit office staff.

Stanley Furnace Corp., Detroit, Mich., has appointed as its distributor for Stanley oil-burning furnaces for the entire State of Louisiana, the A B C Oil Burner and Heating Co., 1907 St. Charles Ave., New Orleans, La.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., at a recent directors' meeting in New York, appointed J. S. Tritle, formerly in charge of manufacturing operations, as a vice-president. Mr. Tritle has had his headquarters at Mansfield, O., but in his new position he will be located at the main plant in East Pittsburgh.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., reports that Alfred P. Mudgett, formerly sales manager of the Minneapolis company in Wabash, Ind., up to the time of its merger with the Honeywell Company, of Minneapolis, has recently been appointed vice-president and general manager with headquarters in New York.

Century Electric Co., St. Louis, Mo., has purchased Roth Brothers & Co., Chicago, Ill., manufacturers of D.C. industrial power motors, D.C. and A.C. generators, etc. Roth Brothers & Company will be operated as a division of Century Electric Company, but some of its products will be manufactured in the company's plant in St. Louis.

Wagner Electric Corp., St. Louis, Mo., has moved its Buffalo service station and branch sales office to a new building at 1796 Main Street.

S. T. Johnson Co., Oakland, Calif., has appointed the C. Manning Plumbing Co., Richmond, Va., the Oil-O-Matic Heating Co., Charleston, S. C., Dinkins & Churchill Plumbing Co., Yreka, Calif., Merco Oil Heating Co., Trenton, N. J., Lagasse Brothers, Fall River, Mass., and the Howden Utilities Co., Savannah, Ga., as Johnson representatives in their respective territories.

Alabama Pipe Company, has appointed B. A. Schutz, eastern sales manager to succeed the late John F. McClure. Mr. Schutz will have his headquarters at the company's offices, 342 Madison Ave., New York.

Crane Co., Chicago, Ill., reports the resignation of Howard S. Hounslea as manager of the Bridgeport, Conn., branch. Mr. Hounslea was associated with this company for twenty-five years, for the past fifteen of which he has held this position. His new association is with Seeley & Jones, Inc., of Bridgeport, as treasurer and manager.

Weil Pump Co., Chicago, Ill., announces the following changes and additions to its list of distributors and sales representatives: Denver, Colo., John A. Lungstrum; Peoria, Ill., J. M. Shea & Co.; New Orleans, La., R. K. Rothrock; Minneapolis, Minn., Bernard L. Mulcahy; Kansas City, Mo., O. G. Smith; Lincoln, Neb., A. F. Paige; Asheville, N. C., A. C. Sigmon Engineering & Equipment Co.; Portland, Ore., Northwestern Sales Co.; Philadelphia, Pa., Walter H. Eagan & Co.; Spokane, Wash., Heating Assurance Co.; Memphis, Tenn., Hoshall Machinery Co.; Manila, P. I., J. A. Murphy Co. P. S. Lord has joined the company's sales staff in Portland, Ore. W. K. Hornbuckle is representing the company in Memphis, Tenn., where he is manager of the Memphis office of the Southern Sales Company.

Brown Instrument Co., Philadelphia, Pa., is building a new two-story and basement addition to its Philadelphia plant; also a new central wing of two stories and basement. The additions will be of reinforced concrete and will cost $200,000. The Ballinger Co., Philadelphia, is architect and engineer. Floor space will be increased 50% by the erection of the new building.

Chicago Mill and Lumber Corp., Chicago, Ill., announces the appointment of Harry D. Thorn as manager of advertising and sales promotion for the company's insulating board division. Mr. Thorn formerly was advertising manager for E. L. Bruce Co., and the Insulite Company.

New York Power & Light Corp., Albany, N. Y., has appointed T. W. Halloran as its gas heating engineer. Mr. Halloran will devote his attention to the promotion and installation of home-heating installations. His headquarters will be in Albany. For the past five years Mr. Halloran has been connected with the Utica Gas & Electric Company, first as plant engineer and more recently as gas sales engineer in the commercial department.

Surface Combustion Co., Toledo, O., has promoted C. B. Phillips from assistant sales manager to sales manager of the company. He succeeds F. W. Menker, who has resigned to take a position with the Great Lakes Steel Corporation, as assistant to the president. Mr. Phillips has been with the Henry L. Doherty Organization since his graduation from Purdue, in 1917.

Brown Instrument Co., Philadelphia, Pa., announces the removal of its Pittsburgh office to larger quarters at 1522 Oliver Building.

Philip Gies Pump Co., Ltd., Kitchener, Ont., has purchased the Fireball Oil Burners, Ltd., of Toronto, and is moving its Toronto branch to the store formerly occupied by Fireball Oil Burners, at 533 Yonge Street.

COMFORT

Broadway Savings Bank, Lawrence, Mass. Architect: James E. Allan, Lawrence. Heating & Ventilating Contractors: Bride, Grimes Co., Lawrence.

...without conspicuous steam connections

Unit Heater-Ventilators fitted in well with the requirements of the Broadway Savings Bank at Lawrence, Mass.

The Units were specially finished to match mahogany woodwork...and all steam connections were enclosed within the cabinets. They present a particularly pleasing appearance — thoroughly in keeping with the dignity of the institution.

Sturtevant Unit Heater-Ventilators are designed to draw in—from out-of-doors—controlled quantities of air; filter it clean, warm it to desired temperature and admit it to a room, noiselessly, safely,—without the hint of a draft. The temperature-controlling mechanism is simple and trustworthy...it may be entirely automatic or each unit may be manually operated if desired.

If you would be interested in a collection of pictures showing the application of Sturtevant Unit Heater-Ventilators to buildings, old and new, it will be a pleasure for our nearest Branch Office to send you our new Catalog No. 361

B. F. STURTEVANT COMPANY

Plants and Offices: Berkeley, Cal. · Camden, N. J. · Framingham, Mass. Galt, Ontario · Hyde Park, Mass. · Sturtevant, Wis.

Branch Offices at: Atlanta; Birmingham, Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas, Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C. · *Canadian Offices at:* Toronto; Montreal and Galt. · *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg. *Also Agents in Principal Foreign Countries*

Sturtevant *the Silent* Unit Heater-Ventilator

Reg. U. S. Pat. Off.

SUPPLIES OUTDOOR AIR FILTERED CLEAN AND TEMPERED

The Door to Service

In the purchase or specification of automatic controls there is a definite consideration beyond the service that the goods themselves provide---the service which is rendered by the control manufacturer.

That service, with us, begins before there is an actual purchase. Engineering help is available for the solution of your control problems---and that service continues with a national distribution system to give you prompt delivery. Furthermore adequate personal contact gives you the advantage of our control experience at all times.

We appreciate the necessity for service ---prompt, efficient and thorough-going in every particular. Our door is truly the door to service, before, during, and after the purchase of Time-O-Stat products.

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

Successor to

Time-O-Stat Corporation
Absolute Con-Tac-Tor Corporation
Leachwood Company
Cramblet Engineering Corporation

Manufacturers of AUTOMATIC CONTROLS *for*

Oil Burners - Gas Burners - Electric Refrigerators - Mechanical Stokers - Furnace Fans
Industrial Ovens - Ice Machines - Unit Heaters - Water Heaters - *Also* Sign Flashers
Mercury Switches - Electric Heaters - Corrugated Metal Bellows

The simple way to equalize *forced* hot water heating

GRINNELL, master builder of heating, industrial, and power piping and fittings, backs this revolutionary development in *forced* hot water heating.

Equiflo Valves permit easy calculation of pipe sizes by simple tables similar to the tables commonly used in vacuum steam systems.

They make radiator and piping changes possible *without recalculation of sizes.*

They serve as the regular shut-off valve for each radiator.

Grinnell Equiflo Valves are specially suitable for hospitals and other institutions; for offices and large residences; on any job where *forced* hot water heat has proved its superiority.

Study the variety of jobs represented in the following installations.

GRINNELL EQUIFLO VALVE

All there is to it.

The proved way to simpler *forced* hot water systems

Only Equiflo Valves can give you

1. *Equalized* circulation of water *at all temperatures.*
2. Simplified design.
3. Cheaper first cost.
4. Lower operating costs.
5. A regular shut-off valve for each radiator.
6. A modernized *forced* hot water system. Equiflo Valves are quickly installed on existing systems.

A Few Prominent Equiflo Valve Installations

INSTALLATIONS	LOCATION	ENGINEERS
Walter Reed Hospital	*Washington, D. C.*	U. S. Government (War Dept.)
Goes Lithographing Co.	*Chicago, Ill.*	Schmidt, Garden & Erickson Co.
Packard Motor Car Co.	*Detroit, Mich.*	Sessions Engineering Co.
Girard College—2 jobs	*Philadelphia, Pa.*	Day & Zimmerman Eng. & Const. Co.
Summit County Childrens' Home	*Akron, Ohio*	Geo. S. Rider Co.
St. Marys of the Springs Academy	*Columbus, Ohio*	J. G. Adams
Governors Island Barracks	*New York*	U. S. Government (War Dept.)
W.S.A.I. Broadcasting Station	*Mason, Ohio*	Henry Niemes, Inc.
D. C. Wilson Residence	*Oakland County, Mich.*	Newel. J. Hill
Washington Cathedral	*Washington, D. C.*	Frohman-Robb & Little
Test Garage	*Indianapolis, Ind.*	Hayes Bros., Inc.
Tobacco By-Products & Chemical Co.	*Louisville, Ky.*	J. E. Sirrine Co.
Gears & Forgings Co.	*Cleveland, Ohio*	Carter & Richards

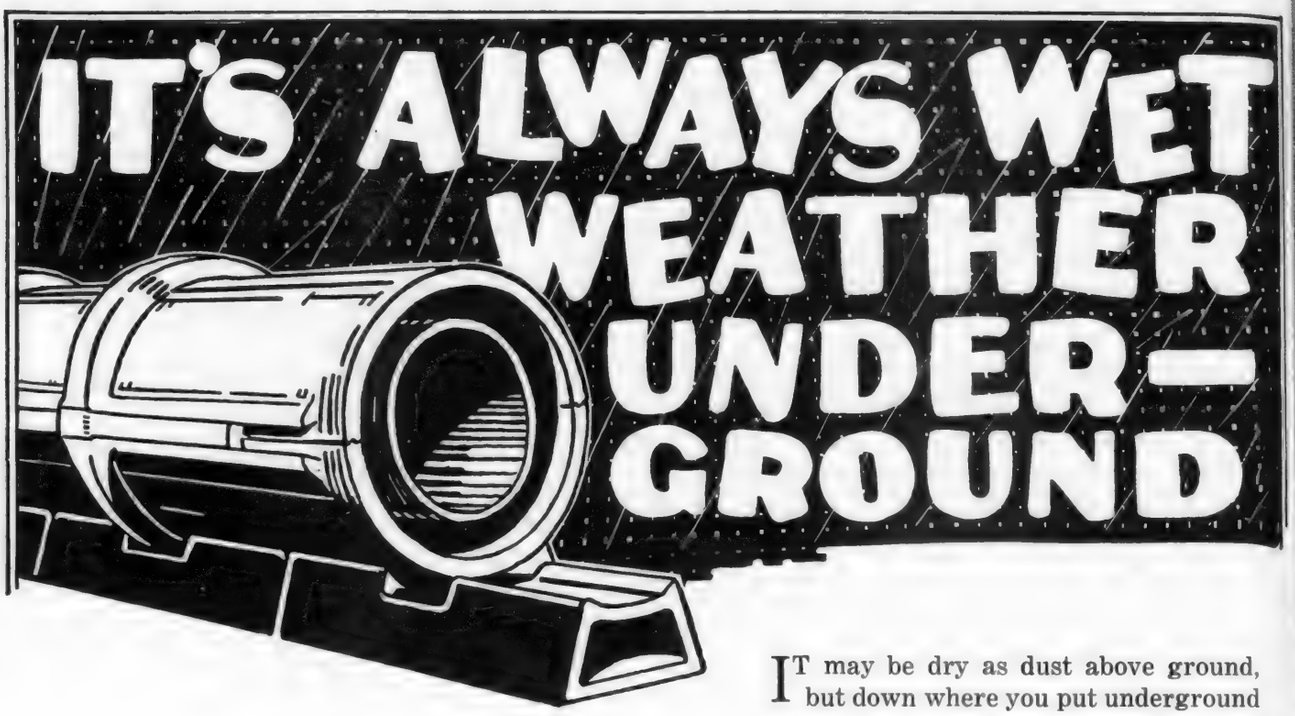
Write for architects' and engineers' data book in blue-print form.
Address Grinnell Co., Inc., 208 W. Exchange St., Providence, R. I.

Equalized circulation guaranteed in either new or remodeled systems

GRINNELL COMPANY

Executive Office, Providence, R. I. ***Branches in all Principal Cities***

Pipe Hangers **Pipe Fittings** **Fabricated Piping** **Thermolier** (*The copper unit heater*)



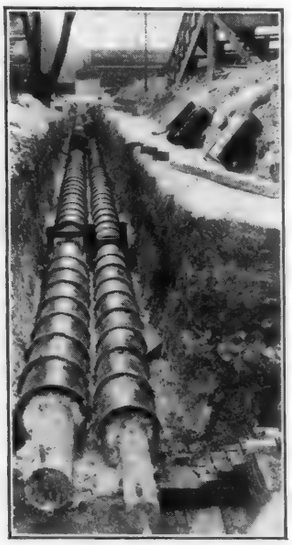
IT may be dry as dust above ground, but down where you put underground steam lines it is always damp; it is often wet and soggy. The back fill hasn't started to settle yet when moisture begins its attack on the conduit housing the insulation you hope will stay dry and efficient. And the battle never finishes. Year after year the undiscouraged wet weather keeps trying to "get" your investment.

Only the finest conduit you can install justifies the cost of the project. Only a conduit of everlasting materials, of more than ample strength, compact and impregnable, sealed to stay sealed, can make you sure your work is more than temporary —and that it is successful.

Twenty years of intensive experience have made Ric-wiL this kind of conduit. Thousands of jobs and hundreds of miles in use are evidence. But more important has been the scientific spirit of our development engineers who have improved Ric-wiL year by year. Today it guarantees the profitable efficiency of any underground steam main.

These 7 ESSENTIALS

1. Safe, immediate drainage, lower in cost than round drain.
2. Conduit with Loc-liP side joints, sealing and locking split sides together, watertight, easily inspected.
3. Quickly installed pipe supports, external, strong.
4. Four types of insulation, including Dry-paC, to meet all conditions.
5. Cast Iron Ric-wiL, for extra heavy duty.
6. Compact, interlocking, fully engineered construction throughout.
7. Such economy of labor, trenching and extra materials that Ric-wiL often costs less than ordinary field-built conduits.



A double line of Ric-wiL Conduit, Type F with Dry-paC insulation, for transmission of steam for power and heating. Job totalling 4800 feet was installed with great speed and economy.

You cannot afford to overlook Ric-wiL in planning your next central heating — no matter what size the job. Write for complete information.

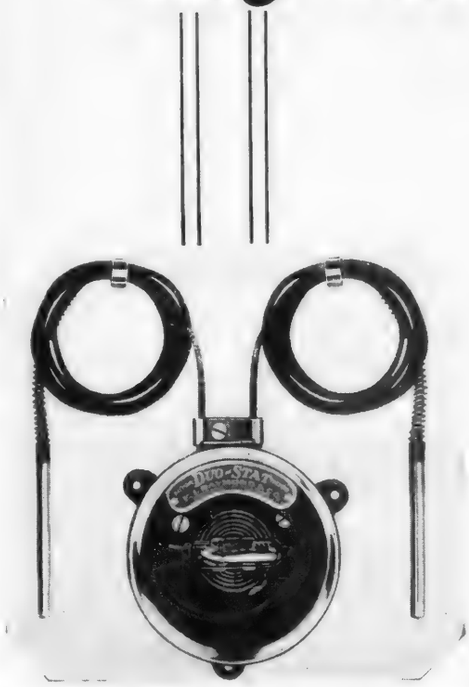
The Ric-wiL Company

1567 Union Trust Bldg., Cleveland, Ohio

New York Baltimore Atlanta Chicago

Originators of Waterproof Conduit Filler

Outside Temperature can NOW be used to control any Heating System



The Raymond DUO-STAT consists of two temperature bulbs, acting on the same mercury switch—one placed outdoors and the other attached to the last radiator on the line.

Any temperature changes—either outdoors or in the radiator—immediately act upon the DUO-STAT which in turn speeds up or slows down the boiler, keeping the entire building at the desired temperature, at all times.

The demands on the boiler are kept uniform—eliminating the costly "pushing" which invariably occurs without this *complete* control.

The function of any control system is to balance the heat supply to offset heat losses —thus maintaining a constant temperature throughout the building at all times.

Outside temperature governs the amount of heat losses from a building—and is therefore the most important factor in heating. *Yet most control systems pay no attention to it,* regulating the system entirely by the temperature of rooms.

THE RAYMOND DUO-STAT

Makes the Weather Control the Heating System

By using *both* the outside temperature and the temperature of the last radiator on the line, to regulate the system, the Raymond DUO-STAT keeps every radiator supplied with the exact amount of heat needed to replace the losses.

It is one method of heat control that is not upset by opening of windows.

The Cost is Surprisingly LOW

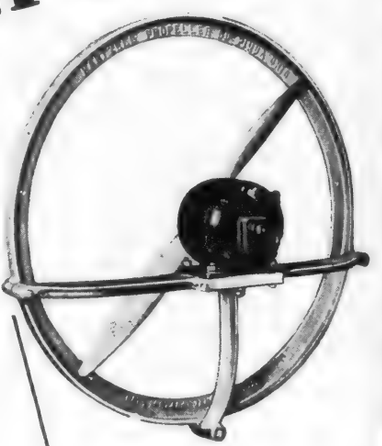
The extreme simplicity of the Raymond DUO-STAT System makes it practical for any building—large or small, old or new, whether heated by coal, oil or gas—and *reduces the cost of complete automatic heat control to a point where any one can use it.*

Ask for complete details of this new and better control system

F. I. RAYMOND COMPANY Builders Building 228 N. La Salle Street **CHICAGO**

THEY SIMPLY COULDN'T BELIEVE IT —

BUT NOW THEY KNOW,—THEY TRIED IT



CHARAVAY Propeller Fans move more air at less cost. Certainly! But when Charavays were first put on the market and the P. A.'s told about it they simply didn't believe it. They were *frankly skeptical.* And among these "doubting Thomases" were shrewd Eastern buyers. Down East they must be shown, as in Missouri. Claims meant nothing—proof everything. But they tried Charavays, and now they Know!

One Philadelphia distributor reports a few of the many Charavay installations in his territory:

DISSTON SAW WORKS
GLOBE DYE WORKS
PACKARD MOTOR CO.
HEINTZ MFG. CO.
GOODYEAR TIRE & RUBBER CO.
SCOTT PAPER CO.
CERTAIN-TEED PROD. CO.
ARMSTRONG CORK CO.
EPISCOPAL HOSPITAL
RACQUET CLUB
COOPER HOSPITAL
CHESTER LACE MILLS
FAMOUS RESTAURANT
RUZBY & SONS
HARDWICK & MAGEE
C. HOWARD HUNT PUB. CO.

There are thousands of others, in various industries all over the country. Let us tell you more of Charavay in your particular field.

HARTZELL PROPELLER CO.
Div. Hartzell Industries, Inc.
716 Craft Street, PIQUA, OHIO

HARTZELL-CHARAVAY PROPELLER TYPE FANS

Hartzell Distributors

Buffalo Fan & Blower Co., 1543 Sheridan Dr., Detroit, Mich.
Ohio Ventilating Co., 111 W. Ohio St., Chicago, Ill.
C. S. Parker, 311 Transportation Bldg., Philadelphia, Pa.

J. W. Thompson, 905 Franklin St., Peoria, Ill.
Northwestern Fan & Blower Co., 447 Wisconsin St., Milwaukee, Wis.
Virginia Sprinkler & Co., 1600 N. Lincoln St., Springfield, Ohio.
M. P. Sinclair & Co., 111 Marietta Street, Montgomery, Ala.
Carrol R. Cox, 1111 Marietta St., Atlanta, Ga.
Missouri Ventilating Equipment Co., 3138 Olive St., A. Mack, Works, Pittsburgh Fan & Blower Co., 447 Barker Place, Pittsburgh, Pa.

P. H. Rogers, 905 Bell Block, Cincinnati, Ohio.
Siebens & Sprague, 324 Hobart St., Oakland, California.
Buffalo Fan & Blower Co., 328 Ellicott Square, Buffalo, N. Y.
Texas Fan & Blower Co., P. O. Box 1023, Fort Worth, Texas.
The Wm. Graham Sons, New York, N. Y., 2148 Grand Blvd.
The W. P. Little Co., 1530 Main St., Hartford, Conn.

Every Feature of ENCASED
ARCOBLAST
Will appeal to Heating Engineers

GALVANIZED ENCASEMENT—Complete and ready for pipe connections.

NO SOLDERED STEAM-BACKED JOINTS—Tubes expanded in headers. Insured ample strength for high pressure.

NON-CORROSIVE—Heating surface entirely non-ferrous metal.

This encased section is designed for pressure from 5 to 200 pounds and is constructed to insure maximum strength with minimum weight. The section is made up of staggered rows of copper tubes expanded into cast iron headers. The tubes are fin wound with extended copper surface—metallically attached with six turns per lineal inch.

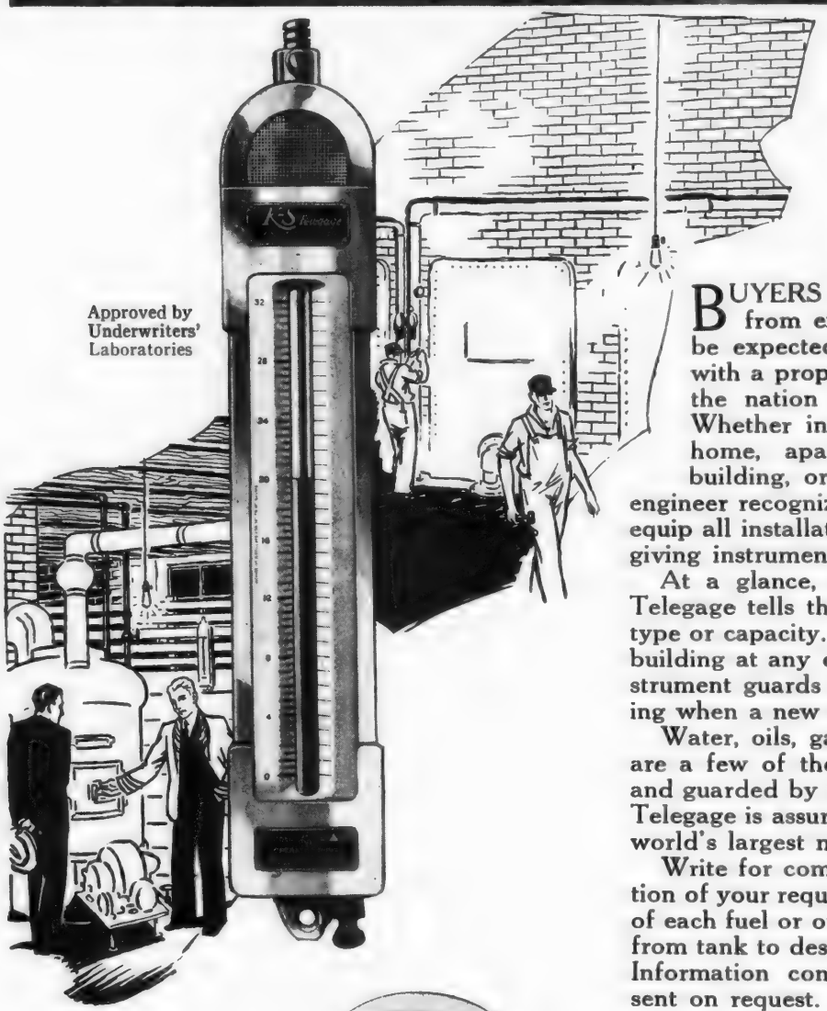
Encased Arcoblast was built to meet a growing demand for lightweight surface for central fan and plenum chamber work. It is designed on the same engineering principles used so successfully in the Arcoblast section used for years in Unit Heater assembly. Encased Arcoblast will meet the most exacting demands of the heating engineer.

Write today for Engineer's Data Book giving complete information.

AMERICAN RADIATOR COMPANY

816 So. Mich. Ave. CHICAGO. **40 W. 40th St., NEW YORK, N. Y.**

THE HYDROSTATIC DISTANT READING GAUGE



Approved by Underwriters' Laboratories

Sell the Fuel Gauge Most in Demand

BUYERS of oil burner equipment have learned from experience that *dependable* operation can be expected only when the fuel tank is equipped with a proper measuring device. This accounts for the nation wide demand for the K-S Telegage. Whether in types of burners used for the private home, apartment house, hotel, hospital, public building, or industrial plant, the up-to-date heating engineer recognizes this demand by preparing himself to equip all installations with this trouble-saving and safety-giving instrument.

At a glance, with ease and dependability, the K-S Telegage tells the depth of fuel in storage tanks of any type or capacity. Placed conveniently in any part of the building at any distance from the tank, this scientific instrument guards the fuel oil supply against errors, showing when a new supply is needed, and how much.

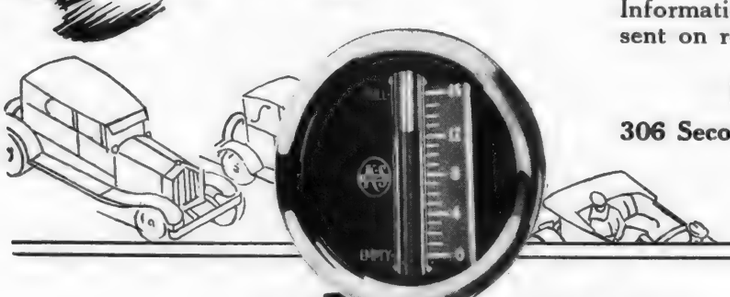
Water, oils, gasoline, fuel oil, finishing materials, etc., are a few of the many industrial fluids stored in tanks and guarded by the K-S Telegage. The reliability of the Telegage is assured by the fact that it is a product of the world's largest maker of distant-reading gauges.

Write for complete information, giving a full description of your requirements—the Baume or Specific Gravity of each fuel or other liquid to be measured—the distance from tank to desired location of gauge—and size of tank. Information concerning our arrangement with dealers sent on request.

KING-SEELEY CORPORATION

306 Second Street **Ann Arbor, Michigan**

New York—44 Murray Street
Chicago—472 Wrigley Building



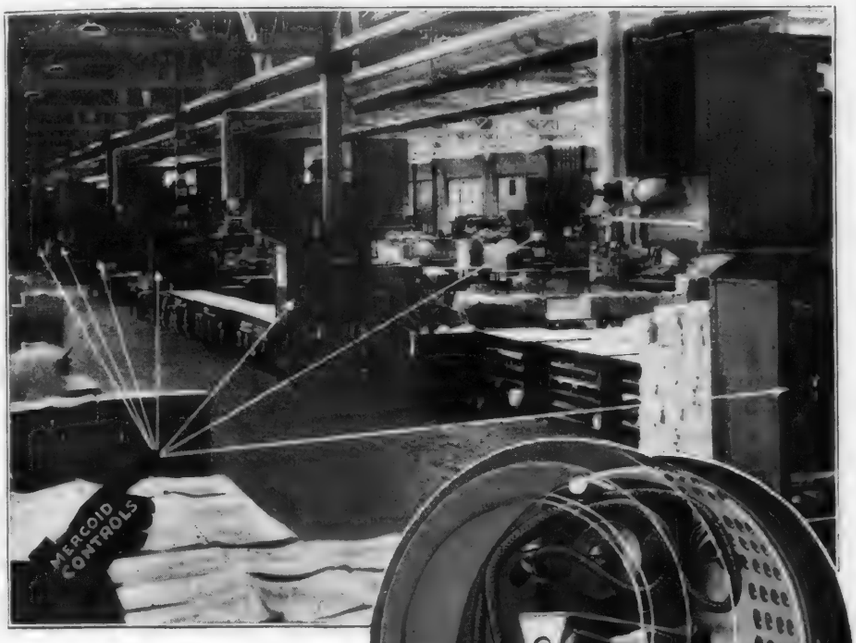
The K-S Telegage

BE CERTAIN WITH THE *K-S TELEGAGE*

Standard factory equipment on three-fourths of all cars selling for $700 or more.

UNIT HEATERS

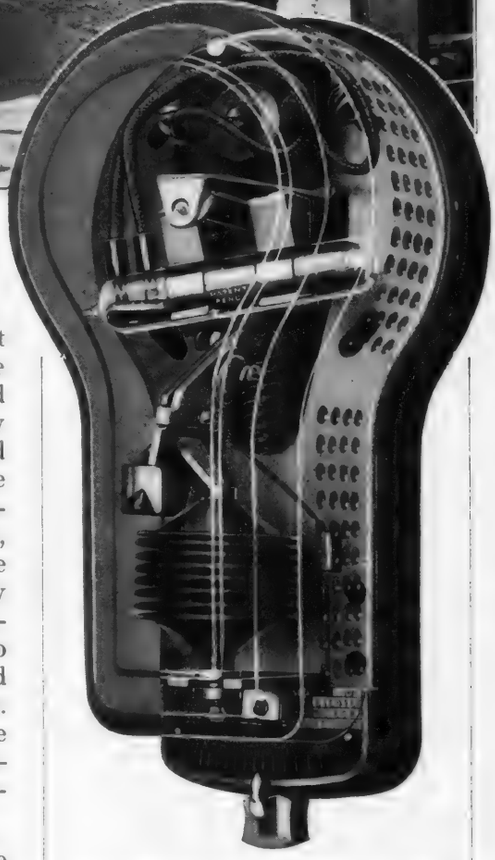
require accurate controls to maintain the maximum efficiency



Interior of a large printing plant where Mercoid Thermostats are employed.

The proper functioning of unit heaters is largely dependent on the type of controls used. Mercoid Thermostats have stood every known test after years of continued service. They hold an enviable record for their unfailing performance. They are accurate, positive, and durable. Mercoid controls are the right type of control for any make of unit heater. They are provided with a locking device to prevent tampering. May be had with or without an alarm circuit. For dual control of unit heaters the Mercoid Risertherm is used in conjunction with the Mercoid Thermostat.

Mercoid Controls will handle motors direct and require no relays where the normal working loads do not exceed 10 amperes at 110 volts or 5 amperes at 220 volts, A. C. or D. C.



PATENTS ISSUED, PATENTS PENDING.
1598874, 1640869, 1658013

The above illustration is a phantom view of a Mercoid Thermostat, showing the Mercoid sealed switch operated with the Mercoid snap-action movement.

THE MERCOID CORPORATION
564 WEST ADAMS STREET
Chicago, Illinois, U.S.A.
New York Office: 25 Church Street, New York, N. Y.

MERCOID CONTROLS

Every Machine Needs Isolation

ANY machine in motion produces vibration and this vibration, unless stopped at the source, is often the cause of troublesome noise. This is particularly true of fans, motors, and pumps used in heating and ventilating systems.

Vibration and the resulting noise can, in a large measure, be absorbed by a cushion of Armstrong's Cork Machinery Isolation placed between the machine and its foundation.

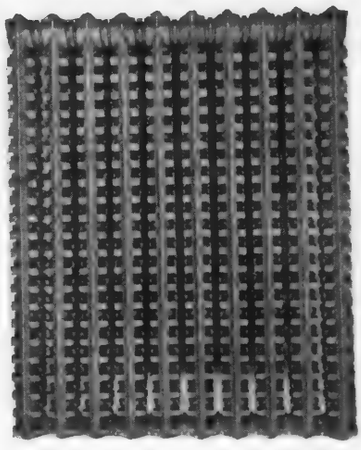
Armstrong's Cork Machinery Isolation is pure granulated cork molded under heat into strong, resilient boards of various densities, to suit different service conditions. Unlike felt, rubber and other materials used for machinery isolation, it does not pack down or harden, but retains its original resilience indefinitely. It is very economical in first cost and remains fully efficient throughout the life of the machine

A folder giving full data, including application details, will be mailed you without obligation upon request. Address the Armstrong Cork & Insulation Company, 925 Concord Street, Lancaster, Pa.

Armstrong's Cork MACHINERY ISOLATION

Ⓐ EVERY BOARD TRADEMARKED

VENTO *again!*



TYPICAL STACK OF VENTO

Fisher Building, Detroit, Mich.

Albert Kahn, *Architect.*
H. G. Christman-Burke Co., *General Contractors.*
Johnson, Larsen & Co., *Heating and Ventilating Contractors.*

12,650 square feet of Vento Cast Iron Heaters have been installed in the new Fisher Building at Detroit. This great structure, conceded to be one of the finest office buildings in the world, is another addition to the long list of Vento installations.

For over twenty-five years Vento has been endorsed by the world's leading Heating Engineers and Architects. And for over twenty-five years the millions of square feet of Vento in constant operation have maintained a perfect record—not one instance of failure.

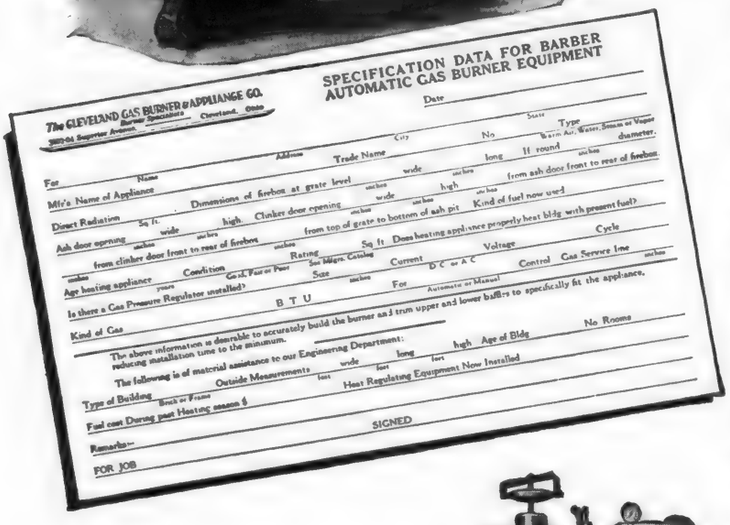
There are two reasons for Vento's success. First, it is made from a superior cast iron which gives it almost unlimited life. The other reason is its unique design and construction which insures rapid circulation of steam and also breaks up air currents so that the entire surface of the heater gives full heating efficiency.

Write today for Engineer's Data Book on Vento and Arcoblast Heaters.

AMERICAN RADIATOR COMPANY

816 So. Mich. Ave., Chicago. **40 W. 40th St., New York, N. Y.**

"Show Them How It's Done With Barber Automatic Jet Gas Burners"



The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue, Cleveland, Ohio

SPECIFICATION DATA FOR BARBER AUTOMATIC GAS BURNER EQUIPMENT

Date

For ____ Name ____ Address ____ City ____ No ____ Street

Trade Name ____ Type ____ Warm Air, Water, Steam or Vapor

Mfr's Name of Appliance ____ Dimensions of firebox at grate level ____ inches wide ____ inches long ____ If round ____ inches diameter.

Direct Radiation ____ Sq. ft. Ash door opening ____ inches wide ____ inches high Clinker door opening ____ inches wide ____ inches high ____ inches from ash door front to rear of firebox

from clinker door front to rear of firebox ____ inches from top of grate to bottom of ash pit ____ inches Kind of fuel now used

Age heating appliance ____ years Condition Good, Fair or Poor Rating ____ Sq. ft. Does heating appliance properly heat bldg. with present fuel?

Is there a Gas Pressure Regulator installed? Size ____ inches Current ____ D.C. or A.C. Voltage ____ Cycle

Kind of Gas ____ B T U ____ For Automatic or Manual Control Gas Service line ____ inches

The above information is desirable to accurately build the burner and trim upper and lower baffles to specifically fit the appliance, reducing installation time to the minimum.

The following is of material assistance to our Engineering Department:

Type of Building ____ Brick or Frame Outside Measurements ____ feet wide ____ feet long ____ feet high Age of Bldg. ____ No. Rooms

Fuel cost During past Heating season $ ____ Heat Regulating Equipment Now Installed

Remarks—

SIGNED

FOR JOB

YESTERDAY'S

Makeshift Methods Might Do—but

TODAY'S

Specialization and the Barber "Tailor-Made" Plan Bring Real Success—Without Guesswork

CONDITIONS change practically overnight in many industries . . . and, in the Gas Conversion Market a decided change has taken place.

The Pioneer days are gone—involving the necessity of convincing the Consumer that there is a MARKET for good Gas "Conversion Burners." Forever past is the equally make-shift method of merchandising Gas Conversion Burners.

The AUTOMATIC era is in vogue—and foremost in evidence is the universally popular demand for the Barber AUTOMATIC Jet Gas Burner System . . . the most scientific, completely self-controlled burner with the highest efficiency in the gas conversion field.

You don't need to guess any longer as to the correct burner equipment to order. You don't need to "sweat blood" over laborious installations. You don't shrink your profits from burdensome overhead. You simply use the Barber Specification Data Sheet. Fill in the information required. Send it to us. We then furnish a Barber "Tailor-Made" Burner Equipment based on these specifications. Your installer quickly completes the installation and your sale is accomplished with clean profits.

Ask for your supply of Specification Data Sheets, containing valuable data to be used by your salesmen to order Barber "Tailor-Made" Assemblies—designed specifically to fit the Boiler, Furnace or Appliance for which they are intended.

Because of the greatly increased demand for Barber AUTOMATIC Gas Burners, we invite correspondence from Direct Factory Representatives and Distributors that have experience selling the Heating Trade and Gas Companies.

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue, Cleveland, Ohio

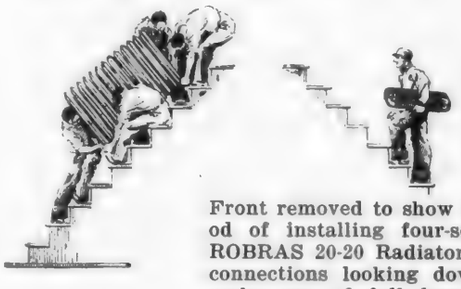
BARBER *Automatic* JET GAS BURNERS

ROBRAS 20-20 Radiator installed in a recess at the head of a staircase, out-of-sight and out-of-the-way.

Can ROBRAS 2°-2° Radiators Be Used at the Head of a Staircase?

To be sure, ROBRAS 20-20 Radiators can be used at the head of a staircase or anywhere else where there is a wall in which a recess can be made. Such a wall installation provides a place for a radiator where frequently one is greatly needed.

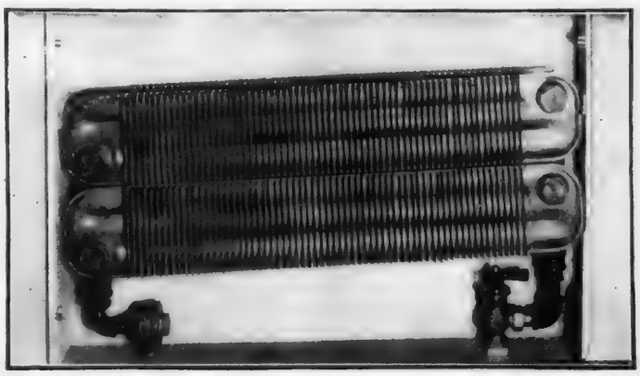
The depth of the recess required for ROBRAS 20-20 Radiators need be only 2¼ inches, for radiators one-section deep, and 3¾ inches for radiators two-sections deep. This is the usual assembly as it permits for use of space between standard studding.



Front removed to show method of installing four-section ROBRAS 20-20 Radiator with connections looking down to make use of full length of recess available.

These ROBRAS 20-20 Radiators are made of brass. Not only are they 20% the size of equal cast iron radiators but 20% the weight. This makes for ease in installation and consequently lowers installation costs. Where it is necessary, a man can easily carry up a ROBRAS 20-20 Radiator of 60 to 80 square feet.

If you have not our price list and data in your files please send us your name at once so that we can send them to you.



ROME BRASS RADIATOR
CORPORATION
ONE EAST FORTY-SECOND STREET :-: NEW YORK CITY

Classified Advertising

Advertisements under this heading, $2 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING — 521 5th Ave., New York City.

FOR SALE—Large established heating and plumbing contracting firm in growing Texas city. Beautiful showroom. First class working conditions. Present name may be used by purchaser with privilege of ten year lease on building. Will consider $60,000. Retiring from business. Address Geo. J. Robischung, Inc., 2372 Calder Ave., Beaumont, Texas.

HEATING and VENTILATING: Prominent contracting engineers, New York, require services two good heating and ventilating engineers. One at least should have had experience in contractor's office as Estimator. Good opportunity for advancement. State age, experience, education, references and salary desired. Address Box 65, care of Heating and Ventilating.

HEATING and VENTILATING ENGINEER and ESTIMATOR, age 30, desires connection with contractor. Large experience in estimating and designing of all systems. Able to superintend installation. Available soon. Address Box 66, care of Heating and Ventilating.

FOR SALE—Minneapoils Heat Regulator Company No. 40 Thermostats, without clock and spring motor complete, new. $20.00. One or one hundred. Address Northern Oil Burner Company, Minneapolis, Minn.

WANTED—Manufacturers Agent to sell Boilers, Tanks and Special Plate Work on commission basis. Address Box 92, Geneva, N. Y.

HOUSE HEATING SALESMAN — Large Eastern utility has vacancy for a man between 30 and 45 years of age for sales work in the use of gas for house heating. Must be Technical High School Graduate and have at least two years sales experience in residence heating. Permanent position; excellent opportunities. Please state age, experience, education and salary desired. Address Box 67, care of Heating and Ventilating.

Opportunity!

THREE million dollar modern St. Louis manufacturing plant 450,000 sq. ft. floor space, with complete machine shop, assembly and painting facilities. Location provides splendid rail and water shipping facilities. Equipped to handle additional business and will entertain any manufacturing proposition.

Address Box 68, care of Heating & Ventilating

BIG BUSINESS SAYS!

"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Summer to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute

Est. 1910.

The most thorough institution for Technical Home Study to-day.

4543 Clayton Avenue St. Louis, Mo.

No. 0 THERMOFLEX BLAST AND DRIP TRAP

Especially designed for dripping large supply mains, hot water heaters, unit heaters, etc. A small combination float and thermostatic trap. Self-supporting in the pipe line. Small, compact, and very efficient in operation. Low in cost, high in quality.

Send for Bulletin No. 52 A.

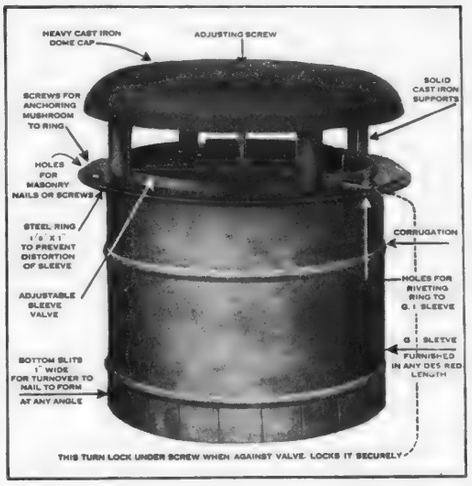
W. D. CASHIN COMPANY

35 HARTFORD ST., BOSTON, MASS.

for perfect QUIET, install AERO VALVE

Rigid locking device prevents rattling. Absolutely fool-proof. Simply turn lock against the valve and it is firmly locked in any position desired. The ONLY mushroom made, the parts of which cannot be separated either before or after installation.

MUSHROOM AIR DIFFUSER


HEAVY CAST IRON DOME CAP
ADJUSTING SCREW
SOLID CAST IRON SUPPORTS
SCREWS FOR ANCHORING MUSHROOM TO RING
HOLES FOR MASONRY NAILS OR SCREWS
STEEL RING 1/8 X 1" TO PREVENT DISTORTION OF SLEEVE
CORRUGATION
ADJUSTABLE SLEEVE VALVE
HOLES FOR RIVETING RING TO G. I. SLEEVE
G. I. SLEEVE FURNISHED IN ANY DESIRED LENGTH
BOTTOM SLITS 1" WIDE FOR TURNOVER TO NAIL TO FORM AT ANY ANGLE
THIS TURN LOCK UNDER SCREW WHEN AGAINST VALVE. LOCKS IT SECURELY

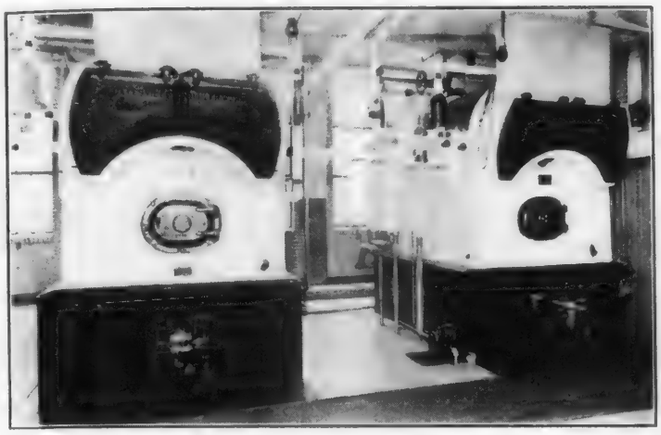
Not only the quietest, but also the strongest mushroom. Made with heavy CAST IRON Dome and Supports. Approved by leading Architects and Engineers. Send for booklet, showing complete specifications.

Knowles Mushroom Ventilator Co.

202 Franklin Street New York City

Another Coatesville Installation

One of the most modern Baking Plants being heated by two Coatesville Series "A" Welded Fire Box Steel Heating Boilers.



GENERAL BAKING CO. PLANT, PHILA., PA.
Rising Sun Ave., Godfrey Ave. and Reading R.R.

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THE KAINER PRESSURE GOVERNOR
The KAINER PRESSURE GOVERNOR
For Hot Water Heating Systems
Reduces the cost of a hot water layout.
Eliminates expansion tank and fittings (with its danger of freezing and overflowing).
Simplifies installation—makes a better job.
Saves your time and your customers' money.
Increases your profits and builds good will.
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Manufacturers

Junior

Burnham Boilers

Do Guard Duty Over Big Jobs of Hot Water Supply

Day and night, the Junior stands ready to deliver a steady flow of piping hot water, on a small ration of fuel.

Keeps tanks up to 700 gallons, piping hot. Five sizes to choose from.

There's a Burnham Boiler for every heating purpose.

Ask for latest catalogue.

Burnham Boiler Corporation

Irvington, New York

Representatives in all principal cities of the United States and Canada.

The

THERMO SYPHON TRAP

—leaves silence on the job as well as safety

WHEN the heating system goes into operation, it is a comfort to building owner, manager and occupant alike to know that noiseless operation is assured by a THERMO SYPHON TRAP.

Maintenance of water level, too, by these dependable devices is "Life Extension" for boilers, on all vapor, vacuum, atmospheric, and modulation systems .... on one or two pipe steam systems from less than atmospheric up to twenty pounds pressure.

Send for Bulletin No. 16-HV giving full details. We solicit correspondence on heating difficulties.

HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves.

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HOT WATER

From the Atlantic to the Pacific you will generally find the largest and the finest buildings equipped with Whitlock Service Heaters

COPLEY PLAZA, *Boston, Mass.*

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A 'phone call to our nearest office—consult your local telephone directory under our name—will bring one of our Hot Water Engineers—who will gladly work with you.

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THE WHITLOCK COIL PIPE COMPANY

40 South Street, HARTFORD, CONN.

House Heating with Fuel Oil

By P. E. FANSLER,
Associate Editor, Heating and Ventilating Magazine

A representative of one of the largest oil burner manufacturers writes us:

"I have just returned from a trip on the road and find copy of "House Heating With Oil Fuel" which I requested you to mail me here, and I herewith enclose order in payment of same. I have bought all available books published on oil burning during past seven years I have been connected with development work in the field, appointing dealers for oil burners, and there has been nothing yet that approaches this book. Every oil-burner dealer owes it to himself to have a copy. I will advise all of our dealers to get a copy of this book as an absolute essential."

362 Pages More Than 150 Illustrations Price $4.00

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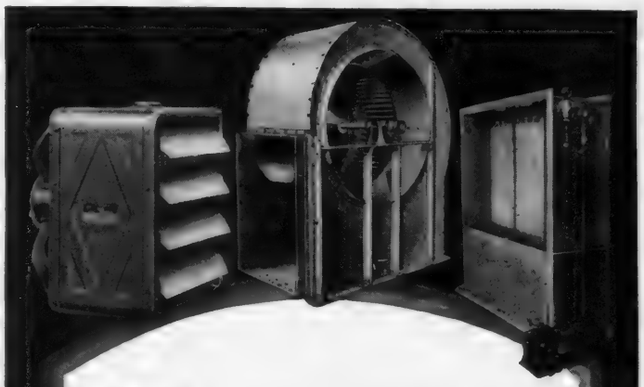
521 Fifth Avenue New York City



FOR your next heating, ventilating or air conditioning job, consider the outstanding merits of New York Blower products—Fans, Blowers, Unit Heaters, Air Washers—they have made good everywhere.

Write for descriptive literature to 3151 Shields Avenue, Chicago

The NEW YORK BLOWER COMPANY

More Economical

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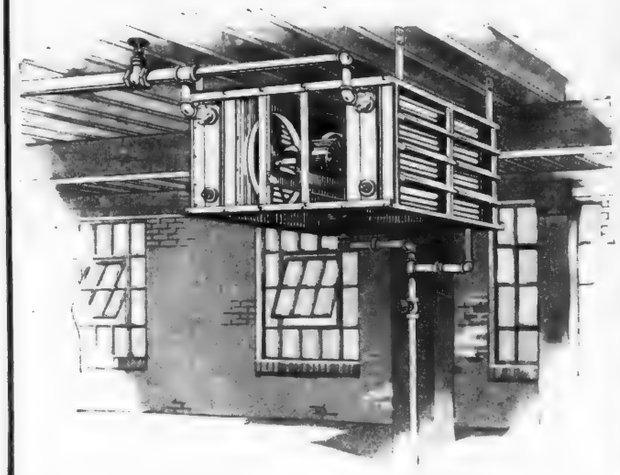
Better Heating

TWINFAN

UNIT HEATERS



Suspended Type F

Twinfan Type F is particularly adapted to large multi-story industrial plants for ceiling suspension. It employs two motors and four fans—each motor operating independently of the other, giving great flexibility of heat control.

Wherever there are spaces to be heated in either large or small rooms of any description, Twinfan Heaters will do it more efficiently.

OTHER TWIN FAN TYPES

TYPE V—The Type "V" Heater gives to the smallest shop the same high standard of heating efficiency formerly enjoyed by only the largest and more pretentious shops, warehouses, garages, etc.

TYPE A—either floor or suspended installation. For heating very large areas.

TYPE D—either floor or suspended installation. For heating somewhat smaller areas.

THE DWYER TWINFAN RADIATOR

The lightest weight, practical copper radiators. All joints between coil pipes and headers are patented **screwed ground joints** — no soldering — no brazing.

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HEAT WITH TWINFAN UNIT HEATERS

Why YOUNG Unit Heaters?

Because they have behind them more than 18 years of experience in the design and manufacture of heavy duty heat transfer equipment—they are an improvement in unit heaters.

In construction they are sturdier, in design they are uniquely advanced. Per pound of weight they deliver more "useful" heated air in the working zone. For detailed information of construction and operation, send for Bulletin H-429.

Young Unit Heaters

YOUNG RADIATOR COMPANY
Heating Division
RACINE WISCONSIN
Representatives in Principal Cities
Correspondence Invited on Open Territories

Young Quality

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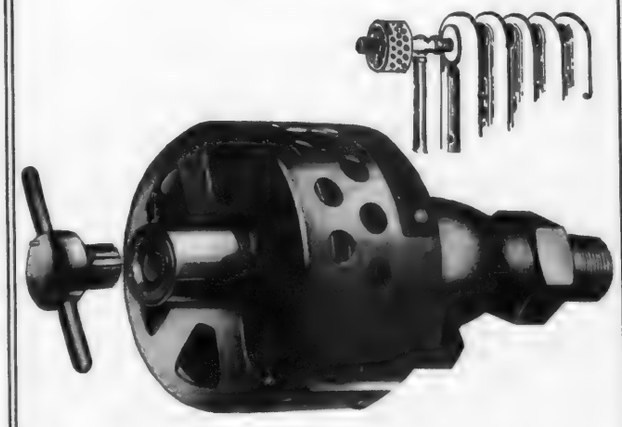
BUILT FOR ENDURANCE AND MAXIMUM PERFORMANCE

Sterlco
TRADE MARK



A Turn of the Key gives them the temperature they want

That's the way to eliminate heat complaints. A turn of the key gives the desired temperature "Warm, Normal, or Cool." Tests made by the University of Pennsylvania prove the efficient performance of Thermotrols in maintaining an even temperature.

Sterlco-Roys Thermotrol

Individually installed, controlled and operated

No compressed air apparatus or electrical connections are required to completely equip a building with Thermotrols. They are attached directly to the radiators—individually controlled and operated. The Thermotrol keeps down fuel costs by reducing the flow of steam to the radiator when the desired temperature has been reached. No fluctuation or waste of heat which makes for fuel economy.

Write for Bulletin No. 44.

STERLING ENGINEERING CO.
1626 Holton Street MILWAUKEE, WIS.

CHECK These Points When You Buy Steel Heating Boilers

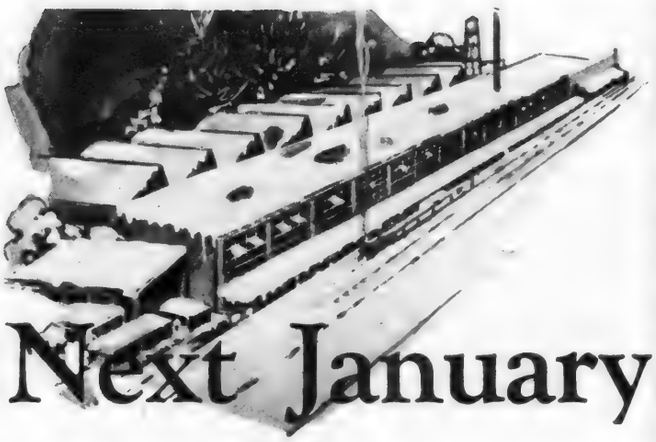
When buying or specifying Steel Heating Boilers it will pay you to consider the six outstanding points about Johnston Boilers as outlined below:

1. **Substantial Construction**
2. **Efficient Operation**
3. **Built to A.S.M.E. Standards**
4. **Simplicity of Design**
5. **65 Years Boiler Building Experience**
6. **Fully Guaranteed**

Ask for Bulletin H-200

Bulletin H-200 gives all the facts about Johnston Steel Heating Boilers in relation to the above six points. If you want to secure a boiler that will give maximum heating efficiency, keep fuel costs at a minimum and last for years be sure to read this bulletin before you buy. Ask for your copy.

JOHNSTON BROTHERS, Inc.
FERRYSBURG - MICHIGAN



Next January

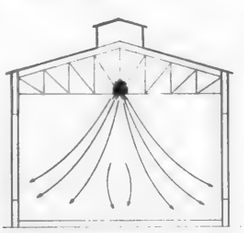
You'll need your heating system to keep you warm —Now is the time to plan it.

THIS paragraph, taken from a letter written last March by a manufacturer in Pittsburgh, Pa., may supply some food for thought in this connection:—

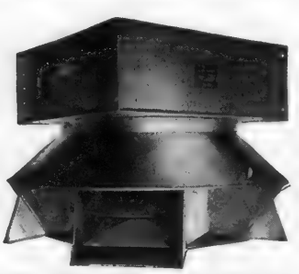
"We have had our Wing Heater installed about a month now according to the plan you laid out here. This heater is giving very satisfactory results and it was necessary to shut it down even during the sub-zero weather we had last month. A curious feature about this installation is that ***the snow remained on the roof of the building heated by the Wing Heater, and the floor was warm,*** whereas in our other building the snow was completely melted off the roof, while the floor was still cold."

Last winter a Wing advertisement asked "Can you heat your plant before you've melted the snow off the roof?" This letter shows that Wing users can. Wing Units heat air and circulate it at the working level. instead of letting it bank up under the roof. This cuts fuel cost.

We'll be glad to send you detailed information about Wing Featherweight Unit Heaters.



L. J. WING MFG. CO.
Dept. 7
158 W. 14th St., New York, N. Y.



Wing Featherweight Unit Heater Type L C

Wing Featherweight Unit Heaters distribute the air they heat downward, in all directions from a point immediately above the area to be heated.

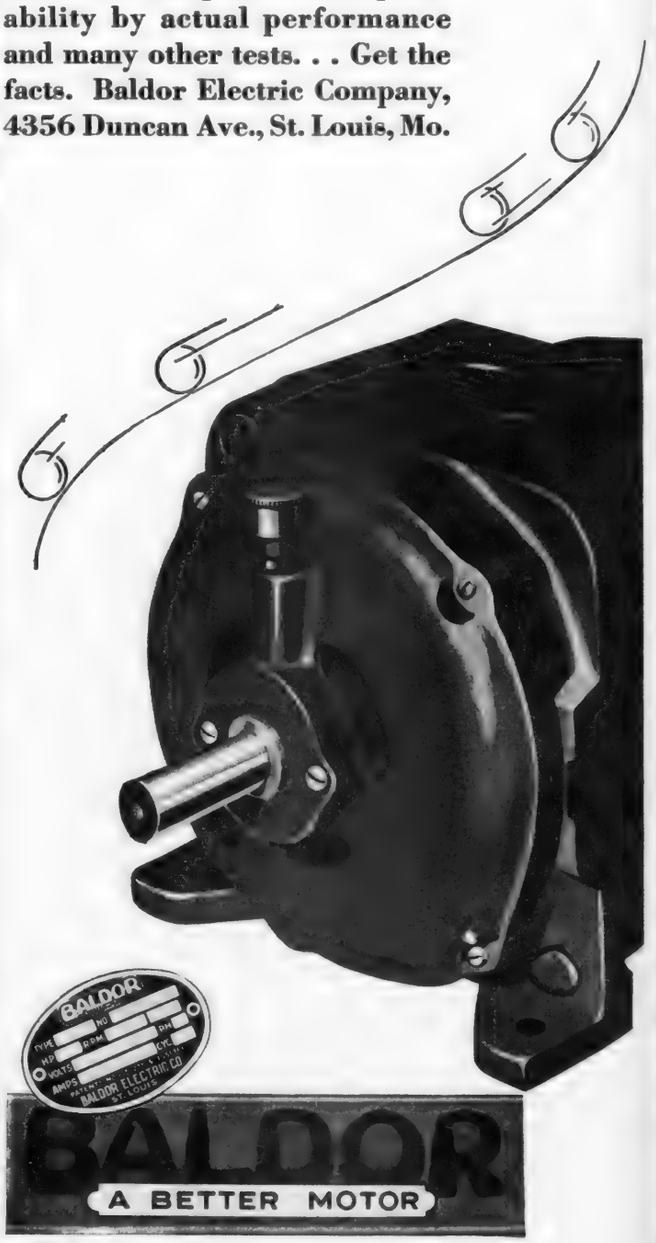
WING FEATHERWEIGHT UNIT HEATERS

BALDOR

Adjustable Variable Speed Motor

Earns Reputation *for* Dependability On Unit Heaters

TRUE to the tradition of Baldor Motors this new motor has proven its dependability by actual performance and many other tests. . . Get the facts. Baldor Electric Company, 4356 Duncan Ave., St. Louis, Mo.



AUTOMATIC ANTHRACITE HEAT

The Electric Furnace-Man

PATENTED AUTOMATIC COAL BURNER

OUR RESPONSIBILITY

THE makers of The Electric Furnace-Man feel that their responsibility to the Heating Contractor goes beyond making and maintaining a first-quality product. The Electric Furnace-Man is a sure means of building a profit business. By making things easier, by solving your problems — by backing to the limit every claim made for our product — by giving you the benefit of our years of organization and experience we feel we shall fulfill the responsibility we know is due you.

The ELECTRIC FURNACE-MAN burns ANTHRACITE—buckwheat or rice. Used in thousands of homes. Fits any heating plant. Ideal for hot water supply.

Write us today for complete details

DOMESTIC STOKER COMPANY
Gillespie Building, Seven Dey St., New York

THIS WAY TO PROFITS

WE TELL YOU HOW!

NOW the Heating and Plumbing Finance Corporation announces that it will finance the sale of American Radiator and Standard Sanitary heating and plumbing products.

Here is the only Finance organization in the country owned and operated by a manufacturer having intimate knowledge of the requirements of heating and plumbing contractors. It was formed to increase sales through financing — not through financing to make profits.

Let us tell you what our Time Payment Plan has done for other contractors. It can do the same for you. It is YOUR way to greater profits. Be sure to get the facts.

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Lowest Fees	No collection expense
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No money "hold-back"	Terms: up to two years

Backed by two million dollar advertising campaign of the American Radiator and Standard Sanitary Corporation

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(1) I wish to become a qualified user of your Time Payment Plan ☐
(2) Send me a copy of "This Way to Profits" ☐
(3) Have a special representative call ☐

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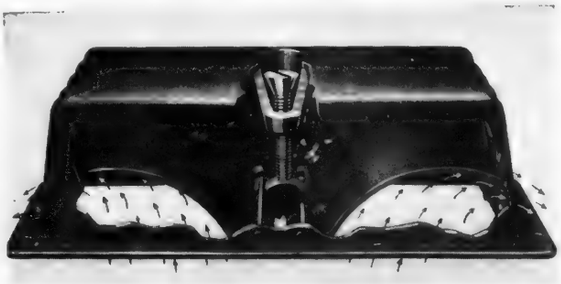
ADDRESS _____

HOUSE HEATING WITH OIL FUEL

House Heating with Oil Fuel comes from the pen of P. E. Fansler, the distinguished authority on oil-heating problems. Packed in the pages of this book is a wealth of information of immense value to the heating and ventilating engineer, the heating contractor, those engaged in the oil-burner industry, and the user and potential user of oil-burning equipment.

This volume contains 362 pages with more than 150 illustrations; price $4. Published by HEATING AND VENTILATING, 521 Fifth Ave., New York.

SUCCESS



Patented

Architects and engineers have instantly seen and recognized the merits of the ENFLO. Although it has been on the market for a comparatively short time, its sturdy and scientific construction has won it many enthusiastic friends.

To those unacquainted with the ENFLO we point to the following features:

1. Made entirely of cast iron.
2. One concealed screw operates both dampers.
3. Curved dampers diffuse air along floor line parallel to rows of seats, eliminating annoyance to those in the immediate vicinity.
4. Inexpensive and economical to install on any type of floor.

VENTILATING PRODUCTS CO.
2800 Cottage Grove Ave., Chicago, Ill.

CONSULT PAGES
154, 156, 158, 160
Engineers'
Specification Index

The TooPas Air Filter
cleans the air twice

BASED on the time tested principles of the Phoenix filter, the new TooPas insures high cleaning efficiency and the elimination of oil entrainment. Sectional construction fits any wall opening. *Send for the Bulletin.*

NATIONAL AIR FILTER COMPANY
205 Central Ave. Louisville, Ky.

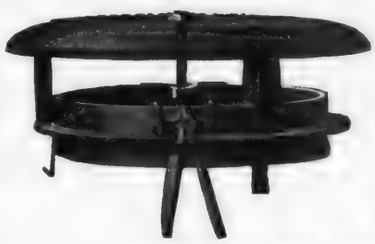
Why NATIONAL HEATERS were selected for the new Y.M.C.A., Norwalk, Conn.

National Instantaneous and Storage Heaters supply hot water for the new Norwalk, Conn., Y. M. C. A.

FIRST, because National Heaters have given fine service on similar installations in the past forty-six years. In addition, they are better made than the average heater ..... they are designed to fit the specifications of each particular job ..... and extra quality may be purchased at no extra cost.

Write for Bulletins 55 and 56. Ask us for quotations

THE NATIONAL PIPE BENDING COMPANY
120 River Street, NEW HAVEN, CONN.
BOSTON NEW YORK PHILADELPHIA



E-Z DAMPER GRIP-TITE Floor Vents

POSITIVE AIR CONTROL AT FLOOR LEVEL

ÆOLUS DICKINSON
3336-44 So. Artesian Ave. CHICAGO
(Some territory open for agents)

ROSS Crosshead-GUIDED Expansion Joint Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
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ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.
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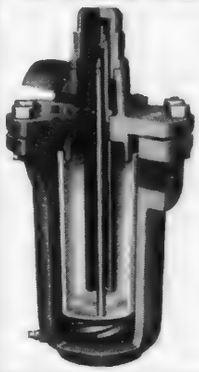
Reserved for YOU

We have reserved a copy of this Atlas Junior Catalog No. 21 for every reader of Heating & Ventilating Magazine. Want your copy? In which of the following are you interested?

☐Reducing Valves ☐Float Valves
☐Temperature Regulators ☐Swing Joint Fittings
☐Bronze Unions
☐Damper Regulators ☐Thermostats
☐Pump Governors ☐Balanced Valves

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.

Trerice Steam Trap



The trap that lasts longer because of the ROTATING VALVE

We will send prepaid to any reputable organization a TRERICE TRAP for 90-day *free test.*

Write for Particulars

H. O. TRERICE COMPANY
1338 West Lafayette Blvd.
Detroit, Michigan

Full Electric Motor
of the
MASTER
Heat Regulator

Better Heat Control
Closer Regulation

Sudden changes in fire regulation, with waste of fuel, are prevented by the Master Heat Regulator.

Its *gradual* operation of valves or dampers insures the utmost uniformity of temperature.

Thermostat shows position of valves or dampers at all times, thus indicating to the user the condition of the fire.

For coal, gas or oil—in any heating system or combination. Clock or plain models. *Sell the latest and best. Write for complete details.*

MASTER HEAT REGULATOR

White Mfg. Co.

2362 University Ave. **ST. PAUL, MINN.**

W-M-C Water Thermostats

For hot water heating systems—accurate, dependable and inexpensive. Easily installed without drawing the boiler or interfering with fire. Write for details.

. . RIGHT . . From Every Angle

Capacity for air removal is the first test of any exhauster.

In this respect, Emerson Exhaust Fans meet the most exacting requirements.

But more important is their ability to keep up their good work over long periods of time. Here's where their sturdy, yet light construction, exceptional motors, freedom from vibration and well balanced blades provide superior long-life performance.

Finally, a helpful factory consulting service is offered free to assist contractors in making each installation successful.

Full Details on Request

THE EMERSON ELECTRIC MFG. CO.
2018 Washington Ave., St. Louis, Mo.
806 W. Washington Blvd., Chicago, Ill.
50 Church Street, New York City

EMERSON EXHAUST FANS

12-16-18-24-30-36 inch sizes.

Made by the makers of Emerson 1/30 to 2 H. P. Motors. A.C. and D.C.

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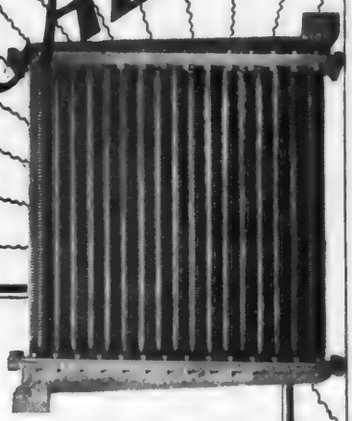


Extended Surface Radiation

Sturdy Non-Corrosive Highly Efficient Low Air Resistance Type

A seamless Copper Tube Heater of great efficiency for all forced air heating systems. Thousands of installations are giving unequalled service.

Helicalfin Tubes are equipped with flat copper radiating fins. There are no corrugations to catch the dirt. We supply a size of Helicalfin Tube for every type of heat transfer equipment.

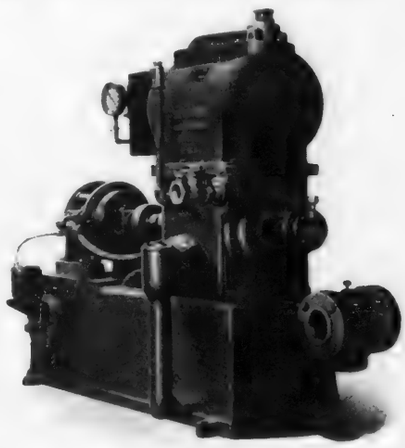
We will be glad to send on request, specification engineering data without charge or obligation.

ROME-TURNEY RADIATOR CO.
ROME, N. Y.
Makers of Good Radiators Since 1905

Low Water Line Control

THE Skidmore Condensation Pump is furnished in all sizes with cast iron receivers of large water capacity, the motor being supported on a rigid cast iron volute bolted to the end of the receiver. A float switch is mounted on top of receiver and connected to motor with flexible conduit.

The centrifugal impeller is of bronze enclosed type and is locked on the end of the shaft against bronze sleeve which extends through the stuffing box over the extended shaft of the motor, which is of ball bearing type, of ample capacity and standard make. Bulletin No. 7 gives you full details.



Low water line control without pitting is made possible with The Skidmore Vacuum Pump on interceptor base.

The unit is self-contained, ball bearing and operated by one motor. It produces vacuum on the system even when operating on float control.

Two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed, comprise the unit. Compactness and minimum floor space requirements are assured through the mounting of both motor and pump on interceptor base.

Ask for Bulletin No 6 for full details of Skidmore Vacuum Pumps

SKIDMORE CORPORATION
General Offices and Factory: 1535 Dayton Street, Chicago
REPRESENTATIVES IN PRINCIPAL CITIES
Canadian Representatives: Darling Bros., Ltd., 120 Prince St., Montreal

Two New Bulletins

Two new bulletins describing Metaphram Damper Regulators have been prepared for distribution to the trade.

Bulletin LP-100 describes Metaphram Damper Regulators for low pressure boilers—steam, vapor or vacuum.

Bulletin F-100 describes the Type "F" Metaphram Damper Regulator for hot water boilers and domestic water heaters.

Heating contractors desirous of furnishing the most sensitive damper control it is possible to secure on boilers of their installation will be interested in the information contained in these bulletins.

NATIONAL

National Systems of Heat Regulation and Humidity Control, Metaphram Dampers, Metaphram Motors, Industrial Thermostatic Devices, A-Jacks Steam Damper Regulator for high pressure boilers, Metaphram Damper Regulators for domestic steam, vapor, vacuum and hot water heating boilers, Metaphram Furnace Regulators.

METAPHRAM

New features of construction are shown that increase sensitivity; reduce friction and eliminate binding in the lever movement, permitting a freer transmission of power developed by the Metaphram units to operation of draft and check dampers.

Copies of either or both of these bulletins will be mailed on request. Just check and sign the coupon.

NATIONAL REGULATOR CO.
2309 Knox Avenue Chicago, Ill.

NATIONAL REGULATOR CO., 2309 Knox Ave., Chicago

Send us ☐ Bulletin LP-100; ☐ Bulletin F-100.

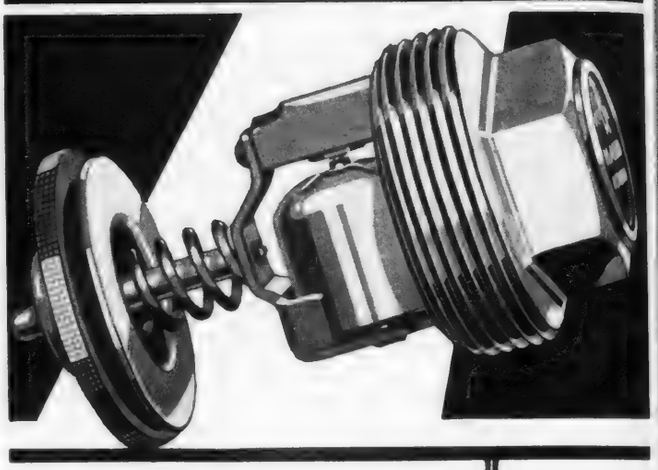
Name.....

Address.....

Town..... State.....

IN-AIRID

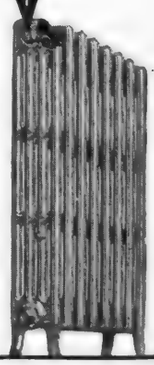
The Invisible **AIR VALVE**



The only way to completely vent new water-for-steam radiators . . The IN-AIRID is concealed within the radiator. . can't be stolen or tampered with . . insures full venting.

No. 1
for Steam

No. 2
for Vacuum



AMERICAN RADIATOR COMPANY

How many five or six room houses

. . . are being built in your community yearly—and how many of the old ones are installing new heating systems? The Bryan No. 6 Boiler is ideal in size for heating houses of this type. Here is a tremendous potential market upon which you can capitalize.

The Bryan Copper Tube Boiler is now universally accepted as the perfect installation for use with an Oil or Gas burner. Designed specifically for the purpose, it incorporates the features which are essential to efficiency and economy. Rapid circulation—perfect combustion—low stack loss—etc., etc.

BRYAN
STEAM CORPORATION
BOILER DIVISION
PERU. INDIANA U.S.A.

Acid Fumes? *Duriron!*

Duriron fan exhausting corrosive fumes from the silver stripping department of a nationally known silver company.

FOR exhausting fumes from pickling, plating and bright dipping departments, chemical laboratories, battery stations, any situation where corrosive fumes are encountered; Duriron fans are extensively used. And Duriron fans exhaust the fumes as readily as other fans handle pure air.

There is no corrosion of fan surfaces, as Duriron is highly resistant to all fumes and vapors. Simple design assures long and efficient operation, with minimum attention.

All types of discharge. Furnished either with motor or for belt drive. Capacities up to 5,000 cubic feet per minute.

THE DURIRON COMPANY, INC.
DAYTON, OHIO

DURIRON
FOR ACID SERVICE

Temperature Controllers

American Precision Temperature Controller

for Water Heaters

PRECISION regulation pays. If the temperature is to be controlled at all, then the closer the better. The American Precision Temperature Controller maintains a uniform temperature all the time. There is never any variation. It will regulate to within 1° F. plus or minus. Compare its accuracy.

The heart of a temperature controller is the bellows. The bellows in the American Precision Controller will expand and contract 60 million times before rupturing. That's what gives it long life. Compare its durability.

The American Precision Temperature Controller will make a satisfied client. It will save him money and eliminate trouble. Here is an instrument backed by 78 years of manufacturing experience. It is simple, rugged, self-operated and guaranteed accurate.

Write for Catalog R-14

AMERICAN INSTRUMENTS

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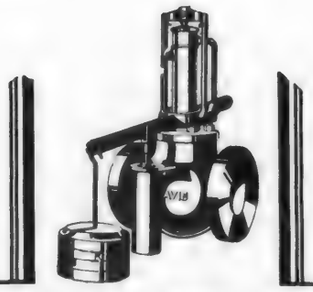

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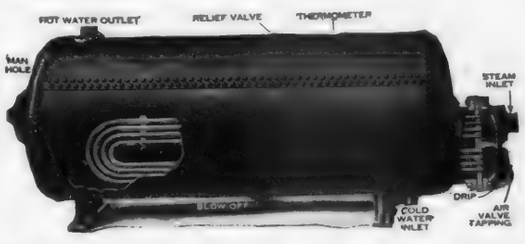

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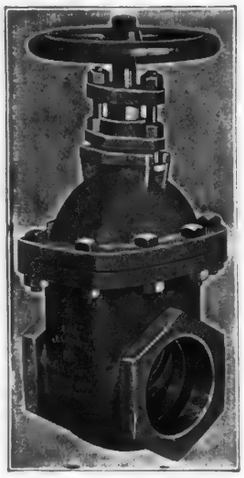

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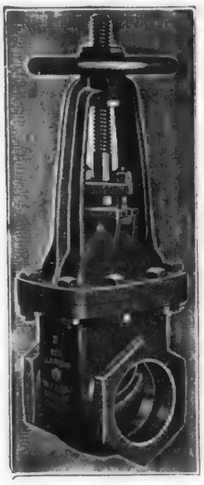

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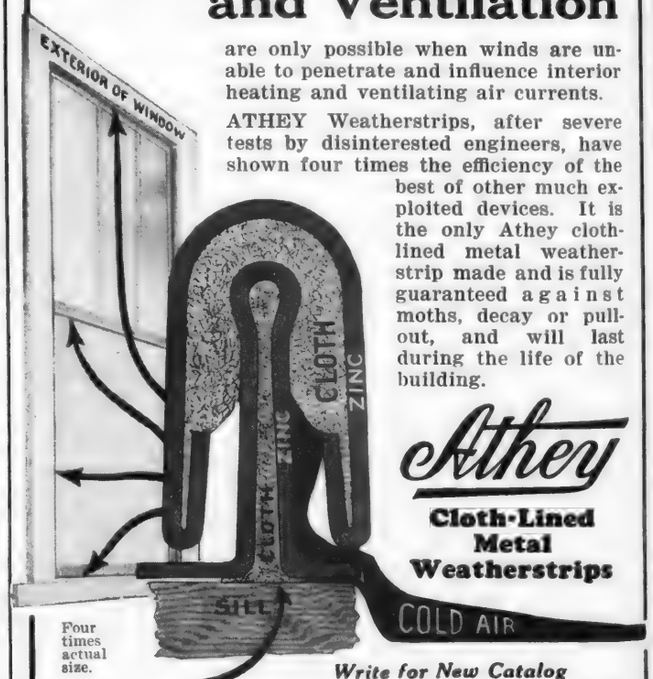

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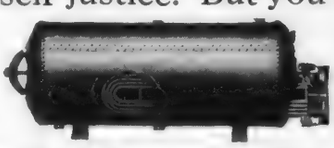

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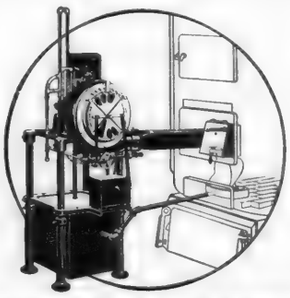

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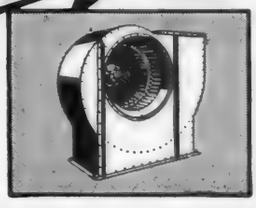

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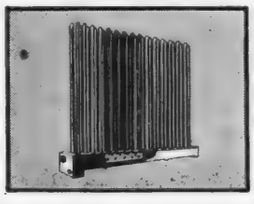

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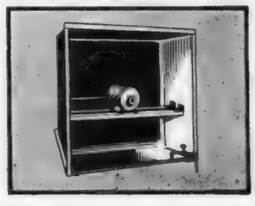

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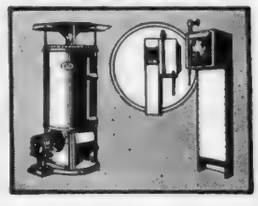

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Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES, MECHANICAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

ENGINES, STEAM
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson, Chicago, Ill.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Co., Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

EXPOSITION
International Heating & Ventilating Exposition, Philadelphia, Pa.

FANS, CENTRIFUGAL
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, DISC
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, PROPELLER
Airmaster Corp., Chicago, Ill.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Emerson Electric Mfg. Co., St. Louis, Mo.
Hartzell Propeller Co., Piqua, Ohio.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

PEERVENT
Heating and Ventilating Units

Lackawanna, N. Y., Schools

FIRST INSTALLATION,	Public School			No. 3	1923
SECOND	"	"	"	No. 2	1924
THIRD	"	"	"	No. 5	1924

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Selling Agents in Principal Cities from Coast to Coast

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Bley & Lyman
Buffalo, N.Y.

FANS, MULTI-BLADE
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, STEEL PLATE
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Walworth Co., New York.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING
Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

FITTINGS, PIPE, FLANGED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FITTINGS, PIPE, SCREWED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FLANGES
Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
General Gas Light Co., Kalamazoo, Mich.

GAS BURNERS (CONVERSION TYPE)
Stockford Co., C. C., Toledo, Ohio.

GASKETS, ASBESTOS
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, METALLIC
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, RUBBER
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.

GAUGES, DRAFT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol, Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, TANK
King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEAT CABINETS
(See Radiators, Cabinet and Concealed)

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Stanwood Corp., Cincinnati, Ohio.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Stanwood Corp., Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm. H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

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Architect and Engineer
HARRY J. EGGLEY, JR.,
Associate Engineer
MODERN HEATING & PLUMBING CO.,
Heating Contractors

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(INC.)
Lynchburg, - Va.

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INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

KETTLES, COPPER
Badger & Sons Co., E. B., Boston, Mass.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPLIANCES
(See Draft Appliances, Mechanical)

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
May Oil Burner Co., Baltimore, Md.
McIlvaine Burner Corp., Chicago, Ill.
Preferred Oil Burners, Inc., Peoria, Ill.
Winslow Boiler & Eng. Co., Chicago, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

OZONE APPARATUS
United States Ozone Co. of America, Scottdale, Pa.

PIPE, ACID-RESISTING
Duriron Co., Inc., The, Dayton, O.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.

PIPE, CAST-IRON
American Radiator Co., New York.

PIPE HANGERS
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

PIPE THREADING & CUTTING MACHINES
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.

PIPE, STEEL
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED

PUMPS, ACID RESISTING
Duriron Co., Inc., The, Dayton, O

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Janette Mfg. Co., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATOR ENCLOSURES AND SHIELDS
American Metal Products Corporation, St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.

RADIATORS, CABINET AND CONCEALED
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATORS, CAST-IRON
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
U. S. Radiator Corp., Detroit, Mich.

RADIATORS, GAS HEATED
General Gas Light Co., Kalamazoo, Mich.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REFRIGERATING APPARATUS
Vilter Mfg. Co., Milwaukee, Wis.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

REGULATORS, TEMPERATURE
(See Temperature Control)

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray)

STERILIZER, WATER
U. S. Ozone Corp., Scottdale, Penn.

STOKERS, MECHANICAL
Brownell Co., Dayton, Ohio.
Domestic Stoker Co., New York.
Fire-King Stoker Co., Indianapolis, Ind.
General Stoker Corp., New York.

STRAINERS, OIL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co. Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

TEMPERATURE CONTROL
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co. Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines.
Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.

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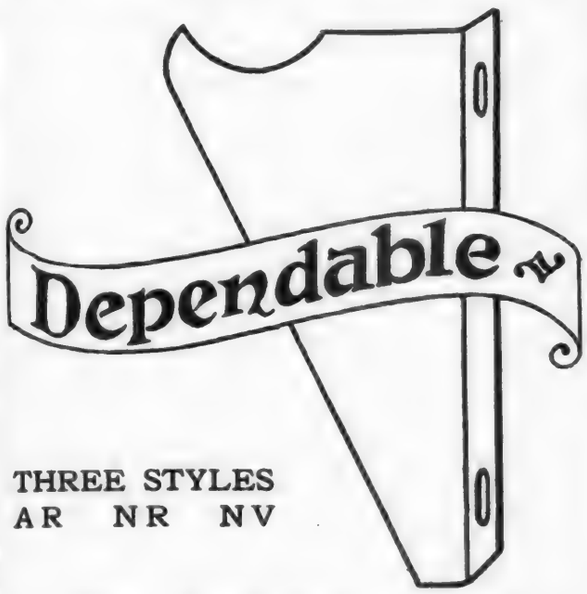

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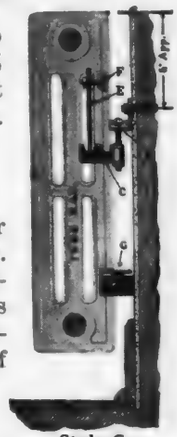

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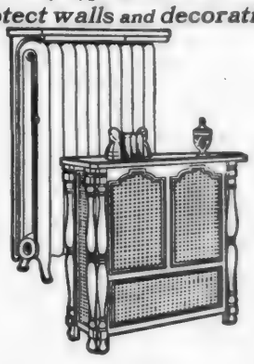

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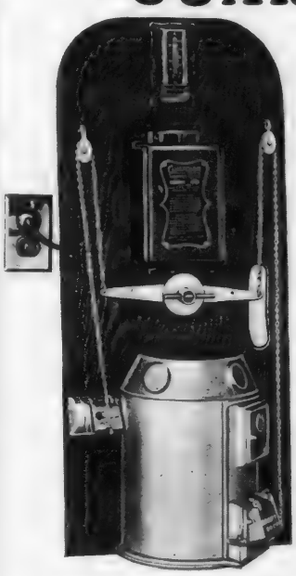

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American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS, BUCKET

Crane Co., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Crane Co., Chicago, Ill.
General Air Filters Corp., New York.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNIT HEATERS

(See Heaters, Unit)

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, BALANCED

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

VALVES, MAGNETIC

Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.

VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
National Radiator Corp., Johnstown, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Walworth Co., New York.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corporation, St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill.

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

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Clow Co., Jas. B., Chicago, Ill.

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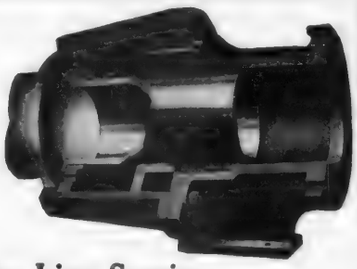
Expansion
Joint



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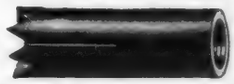

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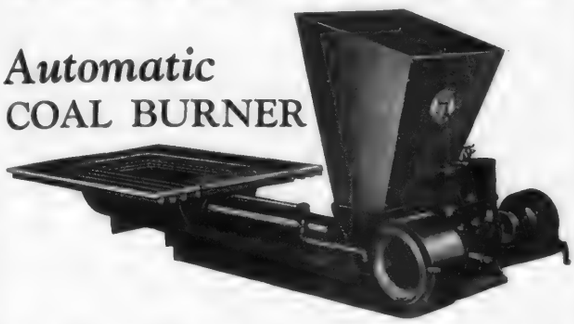
COAL BURNER



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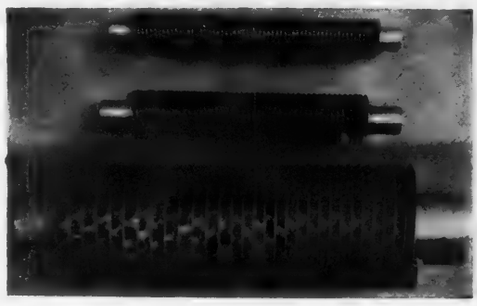

SCHUTTE KOERTING
1153 THOMPSON ST.
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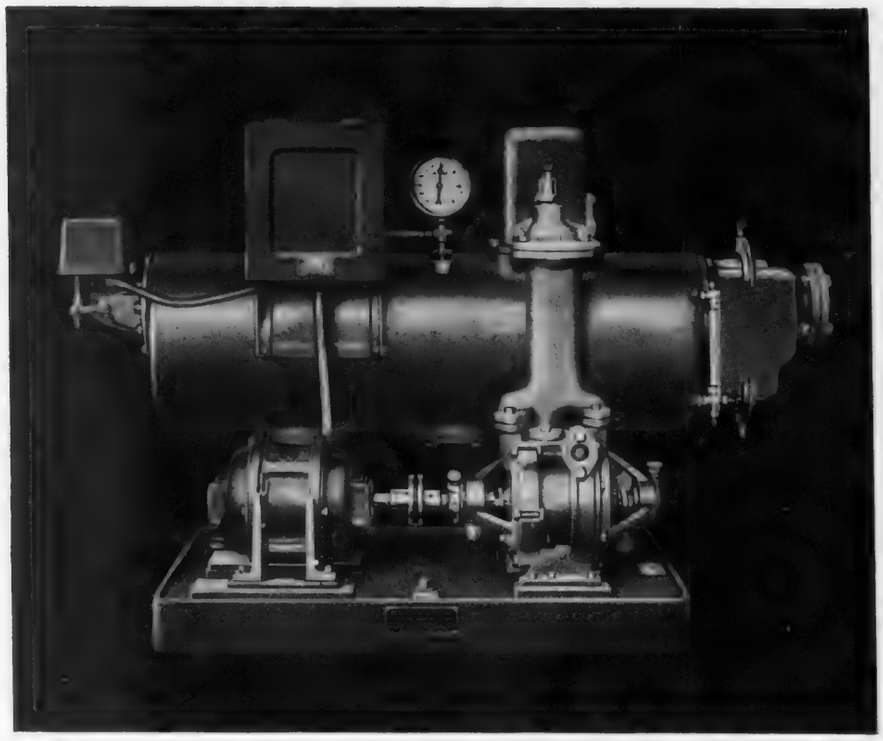

Jennings Vacuum Heating Pumps are furnished in capacities ranging from 4 to 400 g.p.m. of water, and 3 to 171, cu. ft. per min. of air. For serving up to 300,000 sq. ft. equivalent direct radiation. Write for Bulletin 85.

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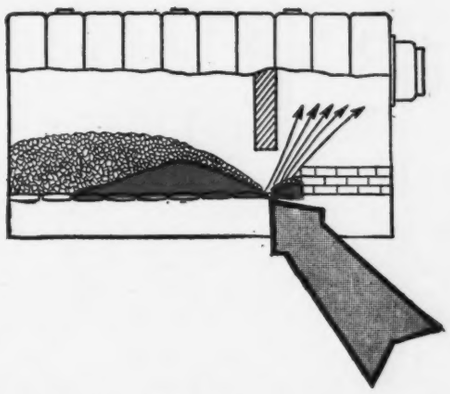

Yes!

The fire has burned through

... *the boiler has stopped steaming*

The illustration tells the story. Fire has burned through, leaving a small section of grates uncovered, and cold air is rushing through. Instantly the boiler stops steaming. *Fire needs attention!*

The Weil-McLain Smokeless Boiler has no thin point in the fire bed, located under or behind a hanging arch, to quickly burn through and require frequent attention.

Instead, there is a uniformly deep, heavy fuel bed, which will keep all grates well covered for many hours. No short firing periods. No special firing. No special kinds of fuel.

This is a modern smokeless boiler improvement of the most important nature. The complete facts are given in two interesting booklets. Write for them.

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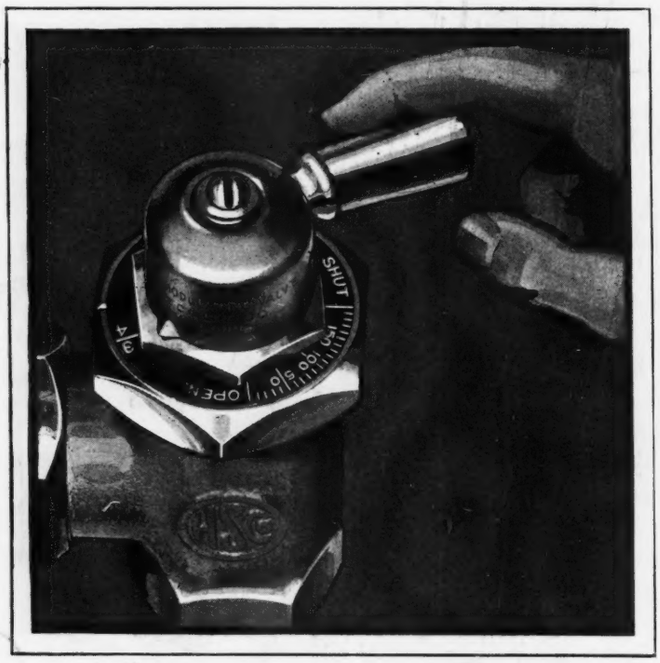
BOILERS

SMOKELESS BOILERS *with* LONGER FIRING PERIODS

With a Wrench in a minute



You can adjust this griefless radiator modulating valve with steam pressure on.

Stop trying to lick pressure differentials on vapor and vacuum jobs, with valves that cannot be adjusted to suit individual conditions.

Try just one job with Hoffman No. 7 Modulating Valves. After that you'll never use any other kind.

Why? Because with these valves you can balance up the system in jigtime so that every radiator, regardless of size, regardless of distance from the boiler,—heats quickly and evenly.

You know what that means, especially on oil or gas fired jobs. No worrying about pressure drops. Far off radiators heat just as quickly and efficiently as do those a few feet from the boiler.

If the owner wants certain radiators (in living rooms, sun-porches, etc.) favored, it's a cinch with No. 7 Valves.

The secret lies in the patented externally adjusted sleeve of the Hoffman No. 7 Modulating Valve. This sleeve enables you to establish a port area that supplies just the right amount of steam for each radiator. Loosen the lock nut, set the dial, tighten the nut. The job's done, and you have a distribution of heat to suit the crankiest customer.

And don't forget that *these* valves can be adjusted *with steam on* and you do not have to break any connections. Ask your jobber about them today. You'll find they cost a little more to buy, but less in the end. Don't forget the time they save and the grief they do away with after the job is in. Hoffman Specialty Company, Inc., Dept. C-52, Waterbury, Connecticut.

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